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A NEW BRITISH ANTARCTIC EXPEDITION.

Every one interested in the exploration of the South Polar region will be glad to learn that Captain R. F. Scott is now prepared to complete the work so well begun by himself, and continued by Mr. Shackleton, in the Ross quadrant of the Antarctic continent. So far as the attainment of the South Pole is concerned, it is well known that only about 100 miles remain to be covered before that point is reached. It is true that this spot may not exhibit any features of exceptional scientific interest, and the Royal Geographical Society could hardly advocate an expedition with the South Pole as its sole objective. Captain Scott, however, has proved his capacity as a leader, and he is certain not to adopt any narrow view of his duties. Moreover, it is useless to deny that there is a widespread feeling that this feat should be accomplished by an expedition sailing from this country. As citizens we all share in this sentiment, and we may, moreover, as geographers, legitimately take full use of this opportunity of obtaining public assistance for Antarctic exploration.

Captain Scott estimates that at least £40,000 will be required to equip his expedition. Part of this has been promised. Captain Scott has already begun his preparations, and if he is to be at his base of operations in December, 1910, as he should be, he will have to leave England not later than August next. It is to be hoped, therefore, that those among the Fellows of the Society who are disposed to lend substantial support to this new British Expedition, will do so without delay. Subscriptions should be sent to Messrs. Cocks, Biddulph & Co., Charing Cross, S.W.

The President has written the following letter to Captain Scott:—

"Royal Geographical Society, 1, Savile Row,
"Burlington Gardens, London, W., Sept. 17.

"My dear Scott,—Many thanks for your letter in which you tell me about your proposed Antarctic expedition. You may certainly count

on me and on the officers of this Society for every help it is in our power to give; and, after I have laid the matter before our Council, I am certain I shall be authorized to inform you of their warm approval of your renewed efforts. In the meantime, please accept my best wishes.

"Yours sincerely,

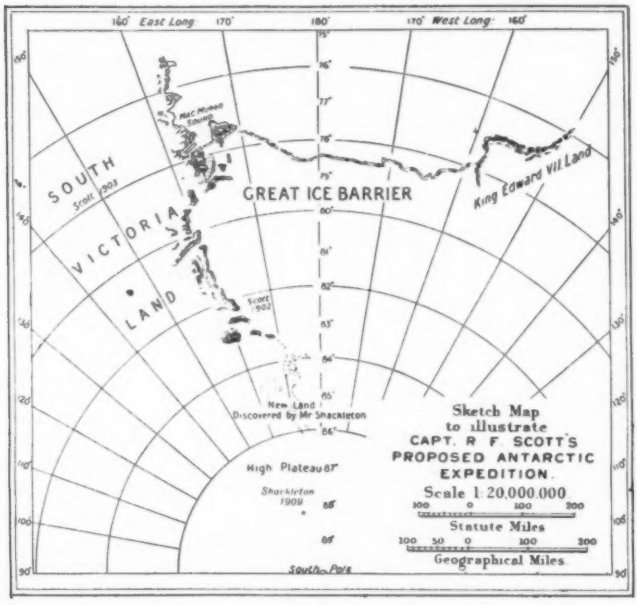
"LEONARD DARWIN."

The objects of the expedition are—

(1) To reach the South Pole.

(2) The further scientific exploration of the Ross sea area.

To achieve these objects, it is proposed to establish two bases, one in



McMurdo sound, and one in King Edward VII. Land. In which of these bases the main force of the expedition is established depends entirely on circumstances.

Should a favourable spot be found in King Edward VII. Land, it may be that the greater force, with provision for an extended southern effort, is landed there, and to the lesser force is given the continuance of the important station-observations to be made in McMurdo sound, and the working out of further geographical and geological details in that region. On the other hand, should the wintering spot in King Edward VII. Land prove unsuitable for southern exploration, or its latitude greatly increase the distance to be traversed to the pole, the programme will be to establish a small party in that region capable of conducting the

station observations and the scientific exploration of the region, whilst the main force is landed in McMurdo sound.

In this case it is hoped that the geographical work of the main party will not be confined to the main southern effort. If, as is anticipated, a large quantity of provisions can be carried to the foot of the great glacier, a sufficient portion, together with the remaining ponies (which cannot be taken up the glacier), can be utilized by a small party to prosecute the further exploration of the mountainous land in a south-easterly direction, and determine finally whether it has connection with King Edward VII. Land, or whether it continues in the direction of Graham Land. Such work should be of great geographical importance, and, together with the exploration of King Edward VII. Land, should throw great light on the nature and extent of the Great Barrier. The general outline of the scientific work of such an expedition is too well known to need repetition, and the advantage of comparative observations in two stations needs no comment. It may be well, however, to lay stress on the advantages which such sciences as magnetism and meteorology will gain by the duplication of observations in known places as being the only means by which secular change and seasonal variation can be determined. Attention might be drawn also to another consideration of great importance. The collaboration between those who have made observations on recent expeditions, and those who have dealt with such observations, should lead to the solution of many elusive problems. For instance, the examination of geological results may point to the exploration of critical localities whence data of the highest importance may be gleaned. Again in meteorology, it seems not too much to expect that consultation will lead to devices whereby some accurate conception of the precipitation and evaporation in various regions may be ascertained. Yet again, the extent to which the study of ice-physics can be carried should now be more surely known, and suggestions as to the prosecution of such study should be more clearly defined. For the better elucidation of these and kindred matters, it is hoped that it will be possible to consult the best expert advice, and secure the formulation of the most detailed and practical instructions. In conclusion, it may be urged that such a programme as has been briefly outlined cannot fail to produce scientific results of high importance, as well as serve a patriotic end, if a proper attention is paid to the details of organization.

THE LOHIT-BRAHMAPUTRA BETWEEN ASSAM AND SOUTH-EASTERN TIBET, NOVEMBER, 1907, TO JANUARY, 1908.*

By NOËL WILLIAMSON.

The river shown on the maps as the Brahmaputra enters the north-eastern corner of Assam through the Mishmi hills. To the Assamese it is known

* Map, p. 480.

as the Lohit; Tibetans call it the Zayul Chu, and the Mishmi name is Tellu. It is the eastern branch of the Tsangpo or Brahmaputra, and after meeting the Dibong, another branch from the north, the two join the Tsangpo, here known as the Dihong, some 15 miles to the west of Sadiya.

Attempts to trace the Lohit have been made at various times—Wilcox and Griffith in the early part of last century; then Rowlatt, and, in 1869, Cooper. Of these Wilcox reached the farthest point, the Ghalum river. In 1854, the French missionaries Krick and Boury penetrated as far as the Zayul valley, in which Rima lies, but were murdered by Mishmis the same year. In 1882, the great traveller A-K carried his explorations down the Zayul Chu as far as Sama, a few miles below Rima, and prior to this certain influential Khamtis had on three different occasions traced the river from Assam up to Rima. In 1885 an attempt was made to prove that the Zayul eventually found its way, not into the Brahmaputra, but into the Irawadi. The following year the ground was cut from below this theory when Needham and Molesworth followed the river up to within a short distance of Rima. None of these travellers gave us a reliable map of the region, and it remained unvisited for the next twenty-one years.

The first two years after my arrival at Sadiya in 1905 were occupied in making myself acquainted with the frontier tribes generally. Anxious to see something of the Mishmis and make myself acquainted with their country, it was my intention to penetrate into the hills as far as possible with local transport, and, if opportunity occurred, to map in the course of the Lohit as far as the limits of British territory. That I should have been in a position to carry on survey work was due to the great interest taken in the matter by Sir Lancelot Hare, K.C.S.I., Lieutenant-Governor of Eastern Bengal and Assam, and to the valuable assistance given me by Mr. John Eccles, M.A., of the Survey of India.

The names of the tribes inhabiting the hills surrounding the Assam valley as shown on our maps are those by which they were known to the Assamese when we occupied the country. These names are still in general use, but they are neither recognized nor understood by the races to whom they refer. Thus the term "Mishmi" is used for the tribes living in the hills between 95° 30′ and 97° longitudes along the north-eastern frontier of Assam, and the people through whose country the first part of the present journey was made are commonly known as Digaru Mishmis, presumably because they live somewhere near a river called the Digaru. They speak of themselves as Taroañ.* The latter half of the journey was amongst a tribe calling themselves Miju (M'ju).

I left Sadiya by boat on November 28, 1907; and on December 7 a Taroañ chief, with several men of his village, appeared at my camp at Samkha in reply to a message that I wanted him to help me with porters to take me as far as his village, Tashalun. He arrived with a large

* Pronounced Tâ-ro-añ, the *n* being nasal.

following, but it consisted mostly of small children. So it was late before we got away, since to readjust the loads to my diminutive porters' capacity took some time and not a little tact. On December 9, Tashalun was reached after a weary three days' trek up and down the dry stony beds of streams, the only paths in these parts. For the Mishmis, who come down to visit Sadiya only during the winter months, the beds of rocky streams, which are dry at that time of the year, form convenient paths. But for the white man wearing nailed shoes it is a tiring game. The country from 4 miles north of Sadiya and from Sunpura to the foot of the hills is covered with dense forest without a sign of human habitation. Here and there, buried in the growth of centuries, are to be found traces of a kingdom of prehistoric times. Gait, in his 'History of Assam,' gives legends of these ruins dating back to the time of Krishna, but tells us that nothing is really known about Sadiya prior to the beginning of the thirteenth century, when the Chutiya dynasty held sway. The Chutiyas sacrificed human beings as a part of their religion, and this method of propitiating the household spirit is still in vogue amongst the Rangpangs living in the hills between Assam and the Hukawng valley.

Tashalun was found to consist of one house surrounded by a number of granaries hidden in dense jungle. In these parts a few houses, or even one, make a village. The explanation is that quite a large community collects under the one roof and really represents the inhabitants of several houses of the ordinary hill type, a household consisting of wives, brothers, brothers' wives, sons, and their wives, etc., etc.

On the 10th I was ready for a forward move, but the elders of the place arrived to say that the porters were all crying and unable to carry loads that day owing to the terrible hardships they had suffered on the road from Samkha! Of course this report was nonsense, and only a prelude to a suggestion of higher wages. Having satisfied them on this point with a promise of one rupee per porter as far as the Tidding river, we arranged to start the next day without fail. The rest of the 10th was occupied in climbing to the crest of the range overlooking the plains, and from a height of 4700 feet a magnificent view was obtained of the Lohit where it debouches on the plains and divides up into a multitude of channels. The water looked a deep blue, and distance rounded off the edges of the numerous islands, giving the whole the appearance of a toy archipelago. Turning in the opposite direction, I got my first peep into the country of the Taroañ—a rugged mass of hills, the nearer peaks here and there covered with snow, and at the back of all a great wall of snow-clad ranges. On my return to Tashalun that evening, the village elders came to tea and stayed until it was time for rum.

On December 11 we got off safely. About half my porters consisted of women, who are more used to heavy loads than the men. They all carried a fair 40-lb. load, but I found them very slow. They were a

cheery, merry crew, however, and I had not the heart to be very angry when only a portion of my tent arrived in camp that night.

My party consisted of my cook—a Buddhist Magh from Chittagong—and a chaprasi, an Angami Naga. I had to confine myself to these two owing to difficulties in obtaining more porters. The cook, however, was not long before he had enlisted one of the local gentry to assist him in the "kitchen." Chowna Gohain, a Khamti chief with great influence in these parts, and a son of Chowsam Gohain, who assisted Cooper in '69, accompanied me, and with him came two of his Khamtis. In addition to the transport difficulty, there was that of food. Rice, I was told, was not available in large quantities, and the fewer mouths to fill the better. Our march on the 11th took us over the first range facing the plains at an altitude of 4600 feet, and we camped that night at the Aharo stream (4200 feet), looking down into the valley of the Tidding. Next day we descended to a village called Salumgum (2300 feet), where I was told I must stop the night, as fresh porters would have to be arranged for for the next stage, though I had hoped to have got as far as the Tidding river that day. However, there was nothing else for it, and as it commenced to rain later in the day, it was perhaps just as well. The people evinced the greatest curiosity as to the object and direction of my journey, and were firmly convinced that I was making for Rima. As news of any event out of the common travels fast in these hills, the authorities at Rima must have heard about my approach to their border long before I reached it, and had they intended to offer objections to my crossing into their territory, I should have seen or heard something to that effect when at my farthest camp—Sati. But the Tibetans made no sign, and I am pretty sure my journey might have extended to Rima without difficulty or objection. This may not be the case again (unless we find China in possession), as possibly in another few years the effects of the Lhasa expedition will have worn off. But as the orders against British subjects entering Tibet are strict, I had to turn back short of Tibetan territory. The 13th found me scrambling down the remainder of the range to the Tidding river, which was crossed (altitude 1200 feet) a mile above its junction with the Lohit. The crossing was made by a bamboo trestle-bridge, which also served as a fish-trap. The streams running into the Lohit are of no depth in the dry winter months, but the current is too strong to admit of their being forded. So a temporary bridge is run across on bamboo supports, held in place by boulders, the footway consisting of a single bamboo with a very shaky rail on one side. Below the footway, in the stream at the point where the current is strongest, several cone-shaped baskets are fixed to the supports, and all fish swept in are very soon drowned. In addition to this temporary bridge every village has its rope bridge, many of them 300 feet in length for use when the rivers are swollen. They are of the single-rope type, and all goes well as far as the bottom of the sag, but from there onwards

hard work with hands and feet is required to haul one's self up the other side. One variety consists of several canes laid together, with a hoop of cane as a runner, through which the traveller passes his shoulders, and, with his legs crossed over the canes, shoots off head first. The other is constructed of a fibrous creeper twisted into a cable, which is both soft and smooth. On this is a wooden runner rounded to fit the cable, and to it several ropes are attached. The passenger ties himself with these

FIRST VIEW OF UPPER LOHIT.

ropes below the runner in a sitting position, and away he goes down to the centre, from where he pulls himself up the other incline.

On December 14 we climbed a small spur and got into the valley of the upper Lohit, at which I got my first peep from a height of several hundred feet. From here on we practically had no climbing. Occasionally we had a slight rise of a couple of hundred feet or so to get over a spur, but beyond that I was surprised to find how easy the country was. In places we came on long flat shelves along and above the river, which only wanted the undergrowth cleared away to become

an excellent level road. But oh! that undergrowth! It was a mass of thick reed, with a tunnel through it which the people called a path. On December 14 I reached the Tellua river, and on the 15th the path took us close to the edge of the Lohit and past a charming sandy bay called Narra. A rope bridge over the Lohit was near at hand, and the offer of a rupee soon obtained a volunteer to give an exhibition of how a crossing was made. This took him three and a quarter minutes. We then turned up the left bank of the Um, and after a short climb came out on a level piece of country surrounded by hills, where was Kupa (2000 feet), a village of three houses. The headman Kumnu on first acquaintance seemed a bit sulky, but we soon became excellent friends, and next morning he had arranged for porters to take me on to Sameling.

From Kupa the path returned to the Lohit, and we crossed the Delli river at its junction with the Lohit by the ordinary type of rickety trestle bridge. A short distance brought us to a flat piece of ground below Sameling (1650 feet), where we decided to camp. That night we found that we had selected the spot to which the village *methan* were accustomed to return of an evening to sleep, or rather where they did *not* sleep! I wish they had, instead of wandering round during the night poking their noses into everything. Here Vichy, my chaprasi, who had started fever, became much worse; and on the 17th, as no porters had appeared by 9.30, we halted to give him a chance of recovery. This halt gave an opportunity of climbing out of the valley to look at the surrounding country, of which no view was obtainable near the river, except of an occasional peak, the hills on each side being so steep that they shut out everything. A friendly Taroañ took me up a hill called Birakhu, on which had stood Kaisha's village, destroyed by Eden in 1855 for the murders the previous year of the French missionaries, Krick and Boury. The site has never been reoccupied. Birakhu, having lately been cultivated, was fairly clear of trees, and a glorious view was obtained. As one plodded up the steep path the headwaters of the Delli first came into view, and then snow and more snow and more snow. I looked forward to a grand panorama at the top, but at an altitude of 5200 feet the mist swept up from the valleys and all was blotted out. After a time it cleared sufficiently to show me the hills and give me a view of the country in the neighbourhood, but nothing of the great ranges stretching from the north-west round to the north-east. On return to camp that evening I found Vichy worse. The local nobleman who had consented to help the cook in return for his food plus pay had com plained in the morning of a stomach ache, the result, probably, of a too liberal diet at my expense. I had dosed him with strong ginger, but evening found him still in pain, and he refused to take more. He expected one dose to effect a magic cure, and if it did not he considered the medicine was not worth taking a second time. An evil spirit had

got hold of him, he confided to me, and the only sure remedy was to propitiate it by sacrificing a white fowl. To do so with full ceremonial three whole days apart from the world were necessary, and therefore he had to tender his resignation. He came to see me a few weeks ago in Sadiya, and was much hurt at my mildly suggesting that "the evil one" had been a surfeit of pork. The custom of shutting one's self off from contact with one's fellows is common all along this frontier, on such occasions as a birth, a death, sickness, or some other unusual occurrence. It is called doing "genna," and takes place whenever the slightest ground can be found for it. There is a story of a certain well-known frontier officer being refused admittance to a house where usually he was an honoured guest. On asking the reason, he was told that the household was doing "genna," as the family bitch had just produced pups. On the 18th I again halted for Vichy. The next day, as he was no better, I left him behind with money and medicine in the house of a headman, who promised to look after him, and so lost one of my only two servants. On the 19th, porters having arrived, we marched to Pangum, crossing the Du river, which is smaller than the Delli, but too broad to be forded in comfort. The Du is the boundary between the Taroañ and Miju tribes, and Pangum is the first of the Miju villages. It consisted of some seven houses, the ruler being Dagresson, a headman of great influence in these parts, a sturdy old gentleman with a pleasant face. On the road between Sameling and Pangum I passed a cane bridge over the Lohit, where I found a large party of Mijus waiting to cross, as all the cane hoops had been taken to the other side by previous travellers. On the 20th and 21st I remained at Pangum, while Dagresson made arrangements to get me porters who would go through to the end of my journey and return here with me. I arranged to give each man Rs.10 for the trip. Through porters are a great advantage, as the delay in collecting others daily at each stage is thus avoided.

HALLI RIVER FROM SOUTH BANK OF LOHIT.

One day at Pangum was occupied in climbing a hill near the village, from which I was able to fix my position. No view, however, was obtained, as the forest was thick and the hills round me too high. The altitude of the village was found by B.P. to be 2131 feet, and that of the winter level of Lohit below the village, 1756 feet.

At Pangum I found a couple of Tibetans, traders from Rima, bartering Chinese opium for Mishmi teeta (Coptis teeta), from the roots of which a decoction is made valued in Tibet and India as a tonic and febrifuge. The opium is soft stuff from which the moisture had not been properly extracted, unlike the hard Indian article, which is much preferred by these tribes. All villages I passed through had patches of poppy, but only in very small areas. The cultivation of the poppy gives the owner much trouble. The field has to be fenced in and constantly watched to guard against the depredations of deer and village cattle, who are particularly partial to the plant. The drug is commonly used by the hill people, Dagresson being an exception to the rule. He was a great trader, and he told me one day, "No, I don't take opium, because it is an article with which I trade. Were I to eat opium, I should be eating up my profits."

The want of small coin gave me some trouble during my journey, as I had not brought enough change. A porter for an ordinary march received 8 annas pay, and when one had to give a rupee between two of them it caused a lot of explanation and worry, not only to one's self, but also to the porters. There is little money in these hills, and a Mishmi remarked to me one day that the only way to divide a rupee between two people was to cut it in half.

Dagresson, shortly after my arrival at his village, produced a couple of letters addressed to "Mr. Nicholl, Rima." Mr. Nicholl was a traveller who was expected to arrive at Sadiya from Rima in 1904, and these letters had been sent up by my predecessor at Sadiya through Dagresson for delivery. Mr. Nicholl had never got as far as Rima, and the letters had been carefully preserved for three years. While at Pangum, Dagresson was particularly anxious that I should go as far as Rima, but on my telling him that it was impossible, we agreed that I should make my way to Walung, a village he described as belonging to himself, though inhabited by Tibetans and close to the Rima border. Tibetans, he told me, resorted in large numbers to the headwaters of the Du river to trade, and owing to the isolated position of the Rima province, I am inclined to think that that portion of Tibet relies to a great extent on Assam for imports through the hill people, who are never likely to give us trouble, lest we close our marts to them.

We left Pangum on the 22nd, and reached Tila (2600 feet), following the Lohit. As Dagresson had not been able to get the full number of porters, it was a question of leaving behind the theodolite and plane-table or my tent. In the end the tent was left with one of the many

Mrs. Dagressons, who was selected custodian as she was the proud possessor of a padlock on one of her granaries. The mention of the theodolite reminds me that on first entering the hills I explained that it was utilized for keeping my watch correct to time. Some of these people had a glimmering what a watch was, one of them describing it to his fellows as a device which told noon-time even in the height of the rains when the sun could not be seen for days. This explanation allayed any superstitious fear which may have existed in their minds, and after that I was frequently asked to set up the "time maker."

At Tila I took up my quarters for the night in a Miju house. Things

MIJUS AND TIBETAN TRADER AT SATI.

were not made pleasanter by the cook having to use the fireplace alongside my bed as a kitchen. Culinary operations always cause great interest amongst savages, and consequently the smell of Miju combined with the smoke from the kitchen fire was a little overpowering.

The Halli river (2075 feet) was crossed on the 23rd near its junction with the Lohit, and we then suddenly entered a country covered with pines. From here onwards the rapids of the Lohit became more frequent and resembled small falls. The upper Lohit is nowhere navigable. In fact, it is possible only with great difficulty to get small "dug-outs" as far as the Brahmakund. The night of the 23rd we spent in the forest near the Sa stream (2580 feet), and again out in the open on the 24th at the Ma Ti (stream), as there were no villages at

hand (2580 feet). At the Ma Ti a crowd of people came from Chang-gu, on the other side of the Lohit, to see me, bringing presents of fowls and eggs. Chang-gu is the village from which Cooper turned back to Assam in 1870. As it was Christmas Eve and cleanliness is next to godliness, I had to cast conventionality to the winds and bathe in front of my bonfire surrounded by an admiring circle. After leaving the Halli river no large streams like the Delli and the Du are met with on the right bank. From here the large streams which feed the Lohit flow in from the left bank.

On Christmas Day we reached Wanung (2850 feet), a village with one house, which was found empty on arrival except for an idiot child. The owners were considerably surprised when they came in later to find us in occupation and making ourselves quite at home. The road ran in many places over the boulders in the Lohit bed, and the going was extremely bad. The boulders were enormous, and a slip down between them would have meant a broken leg. Halfway to Wanung we got a view up-stream of a long stretch of the Lohit, with the Ghalum flowing into it in nearly the same line. From a distance they looked one river; a closer view, however, showed the Ghalum to be less than half the size of the Lohit. At the junction of the two rivers, which we passed just before reaching Wanung, the Lohit makes a bend of close on a right angle and narrows from 100 to 60 yards. The river is then a constant succession of rapids and small falls. December 26 found us making for Sati, the path as usual running over level tiers well above the river, varied by occasional drops to those awful boulders. The scenery was very grand and wild—great steep spurs studded with pines falling to the Lohit on either bank, and a foaming roaring mass of water cutting through the centre of the picture. Sati was not reached as expected on the 26th, as a halt for the night was made at Dagresson's suggestion in the forest near the Klang Ti (3020 feet). Sati could have been reached that day, but as an influential Miju lived there, etiquette demanded that my arrival should be announced with due ceremony; a sudden appearance might have clouded the political horizon! So Dagresson went on, and I followed him next morning, arriving at Sati in half an hour. After all he need not have been so particular, as we found the local king, Maiyuonson, away on a trading trip; one of his wives, however, welcomed me and took me in. Chowna, my Khamti friend, shared with me the front room, in which as usual there were two fireplaces. He used to light his fire and have a cheerful blaze; I didn't! The result was that his warm side of the room was always crowded, and my cold end left severely alone, for which I was very thankful at times.

On arrival at Sati, Dagresson again urged my going on to Rima, saying there was nothing to prevent my doing so. Much as I should have liked to, it was under the present orders impossible. Besides,

except for purely sentimental reasons, there was not much to be gained. I had learnt what I wanted to—the attitude of the hill people and the nature of their country—and so had to refuse the tempter Dagresson. It had been my intention to go as far as Walung, but Dagresson had to admit that though he had great influence there, still the people paid revenue to Tibet; so that village was also barred to me. I could see the old gentleman was very disappointed at my decision. However, he packed off his son Tungno to Walung shortly after our arrival at Sati, with orders to kill a cow of his there, and come back sharp with beef and rice with which he wished to feast the party. Tungno returned next day, and the beef was excellent; not that I had anything to complain of in the way of scarcity of meat, as these people go in largely for capons, and a fine bird can be easily got for one or two rupees. Walung is one march from Sati, and it is two more marches on to Rima —the last being a short one. With Tungno came three Tibetans from Walung, who presented me with some eggs and a fowl. They were wild-looking men and very dirty, more so than the Mijus. The authoritative manner in which Dagresson talked to them struck me particularly, and I fancy the Rima people look with a certain amount of awe on the inhabitants of these hills. I remained at Sati during December 28 and 29, and fixed my position with theodolite and plane-table. Dagresson, who was doing the honours of his country, seemed to think a return journey to Pangum by the same route a waste of time. "If you won't go to Rima, and have only come to see the Miju country, see as much of it as you can. Cross the Lohit here and travel back to Pangum along the other bank," was his suggestion, which suited me in every way.

While at Sati I climbed a peak to the west of the village, and at an elevation of 6000 feet had a fine view to the north-east and east, only spoiled by a haze through which one could see no great distance. The great snowy range to the east, commencing north of the Khamti Long, stretches away in about long. 97° to the north, and curves round towards the Lohit and Rima, being in places 15 to 20 miles distant, and forming the divide between the Lohit and the Irawadi. A Miju of Sati, who came up the hill with me, explained that due east on the other side of this range the Kunung river took its rise, and, running south, entered a country "where Sahibs live." By this he meant Burma, and was referring to the N'Mai Kha. "Kunung" is the name by which a tribe occupying the hills to the north-east of the Khamti Long is known. Another tribe, known to the Khamtis as Kinung, has its habitat between the Kunung country and China. The Khamtis report the Kunungs to be decent, quiet folk, but speak of the Kinungs as a warlike, turbulent people who dress like Tibetans. At Sati I met another Tibetan trader from Rima. He seemed to think I was on my way there, but appeared quite indifferent. The position of Sati was found to be lat. 28° 1′ 3″ and long. 96° 54′ 2″.

On December 29 I commenced my return journey, crossing on a bamboo raft a deep pool of the Lohit where there was little current. The river here was about 60 yards wide. At my crossing-point at low-water level a B.P. observation for the height of the Lohit gave 3186 feet. A-K gives the elevation of the Lohit at Rima as 4650 feet, a drop to Sati of about 1500 feet. This is a good deal for the distance, but, as I have already said, the Lohit here descends very rapidly. Another B.P. observation taken at Shirong gave 2688 feet, a fall of 500 feet in 9 miles. The difference between flood and low-water level is 35 to 40 feet; on the Dihong (Tsanpo) the difference is 55 feet some 10 miles before it enters Assam.

Our camp on the 30th was amongst charming surroundings. A flat piece of ground covered with dry bracken in a pine forest about 80 feet above the Lohit, and a clear hill stream alongside; a clean smell in the air, a great bonfire of pine logs—one sighed at the thought of a return to civilization and all its worries—and round me a crowd of Mijus, very savage and very dirty, but withal merry and willing, watching me eat my dinner with the greatest interest. The Miju and other so-called Mishmi tribes compare in manners most favourably with the Abors. It would be impossible with the Abor to allow him near one at meals. Out would go his paw to seize anything new to him, and he would be annoyed if one objected. On the 30th, after leaving Sati, I asked Dagresson to join Chowna and myself at lunch by the wayside, the *pièce de résistance* being a capon presented me by my late hostess, Maiyuonson's wife. Dagresson declined the capon, but asked for some bread, as he was hungry. It appeared that Maiyuonson was his father-in-law, in whose house he could touch no meat; nor could he after he had left the house eat any meat which had come from it. My bread had no connection with Maiyuonson, and so he could eat that. A curious custom, and calculated, I should imagine, to discourage a prolonged visit by a Miju to his father-in-law!

On December 31 we passed through Kraw, a village belonging to the Lamat clan of Mijus. The Lamats live on the left bank and up the Ghalum, which was crossed by a fishing-weir near its mouth. We halted close by on a level plain of short grass under the Miju village of Shirong. This is about the farthest point reached by Wilcox in 1826, owing to the refusal of the Lamats to let him proceed past the Ghalum. After dark I took observations for latitude with the help of Chowna, who held the lamp. It was bitterly cold, and poor Chowna must have been glad when it was over. He was not very enthusiastic on star-gazing in a wintry wind. The Shirong men were all away at Sadiya buying cattle, but soon after our arrival the ladies of the place appeared with presents of fowls and eggs. It is here that the Lohit makes its great bend from north to west, the latitude being 27° 53′ 5″ and longitude 96° 53′ 7″, the altitude, as I have already said, being 2688 feet. On

New Year's Day we passed along above the Lohit, over a very fair path to the La Ti (2400 feet), a river about 30 yards broad. Crossing it, we struck up a steep hillside, and, after rising 1300 feet, found ourselves on a big open plateau between the hills and the Lohit, about three-quarters of a mile broad and 4 miles long, covered with short grass. On it were dotted here and there a number of houses, each surrounded by their own granaries and bamboo clumps. All was so different from what one had been accustomed to. Instead of being close to the Lohit surrounded by dense forest, we were up high on rolling downs well away from the river. The plateau generally, as well as the village, is

THE LOHIT AFTER IT MAKES ITS GREAT TURN FROM SOUTH TO WEST.

called Chang-gu, the headquarters of the clan called Malu by the Taroañ and Peri by the Mijus. It was from here Cooper turned back in the seventies. The story told me at Chang-gu was that the Tibetans, hearing of Cooper's intended visit to Rima, sent word to the Lamats and Malus not to let him through. The Tibetans gave out that if anything happened to Cooper, these clans would be held responsible. This frightened the Malus in case of any misfortune befalling Cooper, and they objected to his going forward. So he had to turn back. It is quite possible the Tibetans did honestly think that harm might come to him amongst the Mijus, and that they themselves might be held to blame. There is little doubt, I think, that the Rima people did have,

and probably have to this day, a dread of the wild Miju. Take the case of A-K. The Tibetans had no idea who he was, and appear to have acted solely with a friendly object when they warned him about the perils of the route between Rima and Assam. The head Tibetan responsible for Cooper's return sent him a present, I was told, of a Tibetan mastiff and a sword, with the message that as he had now seen Tibetan specimens of both, there was no necessity for him to proceed as far as Rima itself. Chang-gu (3700 feet) is marked on maps as Prun, which name nobody recognized. It may have been a mistake for Peri, the Miju name of the clan.

At Chang-gu I saw an animal much like a highland bull. It had been purchased at Rima, and had a thick, shaggy black coat, long slender horns curving forward, then turning back, with sharp points, a tail thick and short, with tail-hairs about 18 inches long; height at the withers (which were not high) 12.1 hands. The Mijus called the animal *chula*, the Tibetan name being *dzu*. It is a different species from the ordinary Tibetan cattle called *man-tsu* by the Mijus, and *lor* by the Tibetans. The price paid for the animal had been three Assam silk cloths, or about 30 rupees. These cloths and musk-pods are the articles principally taken by the Mijus to Rima for barter, 10 rupees a tolah being calculated as the value of the latter.

In Chang-gu I came across a couple of Tibetan traders. They came one day to the house I was putting up in, solemnly sat down close to where I was writing, and after gazing on me for half an hour, got up and walked away without a word. I trust I met with their approval! I remained at Chang-gu on January 2 and 3, 1908, and climbed a hill (5300 feet) to the south-east. The Chang-gu plateau lay at my feet to the north-west, and to the south I looked down a sheer drop of nearly 4000 feet into the La Ti. The haze was very thick that day, and I could only get occasional glimpses of the great snow-barrier between the Lohit valley and the Khamti Long to the south and south-east.

The Mijus bury their dead in a suitable spot near the house. A child is buried at once, but the corpse of an adult is kept in the house from two to four days. The length of time intervening between death and burial depends on the wealth of the deceased—the wealthier the man, the longer the period. The reason given me was, "A rich man has a bigger house and more property in it than one poorer. It is a greater wrench for the spirit of the rich man to part for ever from all his belongings, and consequently we let his body remain in the house as long as possible to please the dead." A month or so after burial, when the deceased's relations have had time to prepare for it, a feast is given to the village. The grave is then opened, and the remains are burnt, the ashes being left untouched.

My stay at Chang-gu came to an end on the 4th, when I continued my homeward journey, reaching the Gam stream that day. *En route*

we met a party of Mijus, carrying great loads of pork. They proved to be a bridegroom and his friends off to Chang-gu to fetch the bride, and were taking the wherewithal to feast her relations. Dagresson failed to arrive that night in camp, and his son Tungno reported that papa was sleeping peacefully on the road, having been overcome by the many stirrup-cups he had drunk with the local kings of the Chang-gu plateau. He arrived next morning, looking bedraggled and bleary-eyed, but a drink of hot tea made him look more himself. Tea I found very much appreciated by all these people, and I am not sure that they do not prefer it to rum. The tea, however, they get from the shops on the

TAROAÑ.

frontier is vile stuff and expensive. On my showing the Tibetans at Pangum some of my tea, I was told that only the wealthy classes at Rima drank it in that form.

The cold at our camp of the 4th was very bitter Next morning at dawn the thermometer registered 29° Fahr., and it must have been a good deal lower during the night. The whole of this valley in the winter has a damp cold temperature, and this is especially the case on the left bank, where, owing to its low declination in December and January, the sun is shut out from many places by the height of the hills to the south. All along the banks pine trees lie rotting. My suggestion

to float down logs to Sadiya, where there was a market for them, met with all sorts of objections as to its impossibility. The hill savage is very wanting in initiative, and the idea will not catch on until some outsider leads the way. On January 6 I recrossed the Lohit to Pangum, the bamboo raft being worked by one of the Tibetans whom I had seen there in December.

The spectators at meals solved a matter one day which had been puzzling them for some time. "What is that brown stuff the sahib breaks up and drinks with hot water?" One brilliant mind at last declared it to be *kaning* (opium).* Cadbury's chocolate accused of being a narcotic!

While at Pangum I measured Dagresson's house, which was 252 feet long and 18 feet broad. It contained twelve rooms, three having two fireplaces, the rest only one. In addition, there was the front common room with the usual two fires. Numerous doors down one side of the house, and on the other a narrow verandah with exits on to it from each room. The house is raised off the ground about 3 feet, and is made of bamboo with timber supports and a thatched roof. This house is of the ordinary type, but of course few are as large. On my asking Dagresson how many people lived with him, he replied that he really did not know, but would count them up for my benefit. So a long piece of stick was selected, a place on the ground in front of me swept clean; down squatted Dagresson, and after many false starts the census began. The sons living with him headed the list, and after he had muttered each one's name a piece was broken off the stick and laid on the ground: these totalled fourteen. The same process for his daughters, a row of nine representing them, and six more for his wives. He had had many others, he explained quite cheerily, but six only remained to him then. A row of thirteen pieces gave the number of his male slaves, and ten the female ones. Here the stick gave out, and a fresh one had to be called for. His sons' wives came to thirteen—a total with himself of sixty-six. But nothing had been said about his grandchildren, and on my mentioning them the old man groaned with weariness. However, more space was swept clean, and he proceeded to tackle the sum. He made out there were thirteen living with him, but thought there were more whom he could not remember. We had to stop here, as the unaccustomed mental exertion was telling on the old gentleman. However, he had accounted for seventy-nine persons in his own house. Leaving out the twenty-three slaves, and fifteen for his wives and daughters-in-law, there were forty people under his own roof directly descended from himself. Also he had other sons with their offspring living in separate houses. Of course this case is an exceptional one, but generally tribes on this frontier are very prolific; even among those who

* A corruption of *kani*, the Assamese word for opium.

are monogamous it is quite common for a woman to bear her husband ten children. The infant mortality from exposure, however, is very great—70 per cent. at the least; and it is an example of the survival of the fittest, from the survivors springing a hardy race of mountaineers.

On January 9 I left Pangum, after an affectionate farewell from Dagresson, Tungno his son, and all their wives. He came in to see me at Sadiya in March, 1908, bringing with him a Tibetan from Rima, but, I regret to say, died shortly after his return home. His influence rendered the portion of my journey east of his village nearly free of all transport worries, usually one's greatest difficulty, and his place will be hard to fill. Tungno his son has succeeded, but unfortunately he has taken to opium, and can never be the man his father was. This reminds me that a report has come down in the last month that the sale at Rima of Chinese opium to the Mijus has lately been put a stop to. I hope this is true, as the habit is doing untold harm in this little corner of the globe.

On January 12 we reached the Tidding river. Instead of crossing we followed it up as far as Pariling. From here we moved to Teronlung (1970 feet), a village on the right bank, and on the 14th crossed the outer range at an elevation of 5922 feet (B.P.), following the path by which the hill people bring up cattle from Assam. A well-graded bridle-path could be constructed over this range without difficulty. That night we camped at the Tiju river (1550 feet) amongst the low foothills, and next day our party was back in the plains.

In appearance and dress there is nothing to distinguish the Miju from the Taroañ. Each speak a dialect which is understood by the other. They intermarry, and both tribes are polygamous, the only limit to the number of wives being the length of the purse. Each tribe is divided into clans, which are exogamous, and marriage is between adults. Though living on the borders of Tibet, no trace of Buddhism is found among them. Their religion is animistic, and consists in the propitiation of the various spirits to whom sickness, failure of crops, and suchlike calamities are attributed. The propitiation takes the form usually of the sacrifice of a fowl or a pig, a small portion being set aside for the spirit, the rest going down the throats of the offerer and his family.

Travelling amongst the numerous tribes which occupy the hills to the east and north of Assam, one is struck by the strange similarity which is sometimes met with between people divided from one another by great distances, and between whom there never can have been any communication in their present locations. The Miju and Taroañ tie their hair on the top of their heads like some of the Lushei clans. Among the "crop-haired" Mishmis we find the men and women cutting their hair very much like the Angami men, and, more curious still, the women wearing the same broad black cane garter below the knee which one meets with amongst the Angami men. The earring of the Taroañ

and Miju women is identical with the large ring of thin brass wire which the Eastern Angami women pass through their ears. But strangest of all is the likeness between the Abors and the Ao, Lhota, Sema, and Trans-Dikhu tribes of Nagas, separated from one another by the whole breadth of the Assam valley and the Brahmaputra. The Abors male and female cut their hair in the round fashion peculiar to these Nagas, and the curious tattoo-markings on the legs and faces of the Abor, Ao, and Trans-Dikhu women are extraordinarily similar, though we find no trace of such marking amongst the tribes occupying the 200 miles of intervening hills. I doubt if many corners of the globe can compare with the region between the Brahmaputra and Irawadi systems in respect of the number of tribes speaking dialects so totally different that no two tribes can understand one another, and yet they spring (except the Khasis and Khamtis) from the same stock. Their languages are classified by Grierson as Tibeto-Burman, and a comparison of common words, as *fire*, *wood*, etc., and of the numerals of such widely separated people as Abors, Aos, Lusheis, and Eastern Tibetans, shows a marked resemblance between the various languages.

As already said, in appearance, dress, etc., there is practically no difference between the Taroañ and Miju tribes, and, unless otherwise specified, any description applies to the two tribes equally. The men let their hair grow long, and tie it in a knot on the top of the head. They wear a small apron in front, a sleeveless coat of a very dark blue, usually ornamented with red thread, open in front, and reaching well down the thigh; a cloth 3 feet wide and 5 feet in length, worn during the day like a Highlander's plaid, at night serving the purpose of a blanket; slung over one shoulder, a large bag, usually of bearskin, hangs in front to the waist, and over the shoulder a strap supports a long knife. Sometimes a piece of coloured cloth twisted round the hair knot completes the attire. Ornaments consist of long cylindrical silver earrings with bell-mouthed ends; some quarter-rupee pieces sewn on a leather strap as a necklace, and a silver charm box of Tibetan manufacture, studded with turquoise, on the chest. The women wear a short little sleeveless jacket covering the breasts, of the same colour as the men's coats; a short under-cloth as a petticoat, and a longer one reaching to below the knee, which is used as a covering at night. They tie their hair behind, and above the forehead wear a thin band of silver fastened under the hair at the back. They wear earrings like those of the men, and some in addition pass a large ring of thin brass or silver through the top of the ear, which is held up in place by a cord across the head. Long strings of glass beads, amber in colour, depend from the shoulders; a number of thin silver rings hang round the neck with a silver charm box like that of the men. All of them, men, women, and children, are great smokers, using home-grown sun-dried tobacco in pipes. The pipes, about 10 to 12 inches long, are of various

kinds, some with silver bowls and mouthpieces, others plain bamboo roots.

These people usually build their villages low down close to the rivers. The want of water prevents their occupying the cooler heights, and as they live at peace with one another, there is no necessity for a strategical site on the top of a hill. They may occasionally have a fight, but they are not raiders or head hunters like the Naga tribes on this frontier. Even in war heads are not taken. All that the victor does, I am told, is to cut off the hair of the slain, which is buried in front of the victor's house. Living at peace as they do, they are constantly on the move, trading between Tibet and Assam. Agriculture and hunting are their other means of livelihood. They are well to do,

BOULDERS ON THE LOHIT RIVER.

and their villages are plentifully stocked with fowls and pigs. Of cattle I saw few, though they buy quite a number from Tibet and Assam, but quickly slaughter them at festivals. There is no permanent cultivation, but a fresh patch of the hillside is cleared and utilized for a couple of years, after which it is allowed to rest for eight or nine years, when it is again cleared, all growth being burnt and worked into the ground. Rice is not largely grown. The staple crop is maize, which they grind into a coarse flour or boil whole. They make from fermented grain a liquor of which they drink large quantities, but I saw little drunkenness.

Their weapons consist of a single-edged knife about 18 inches long,

and a spear. They own crossbows, but the ordinary bow with which they move about is a light one of the usual pattern.

Wandering in the wilds, one is apt to wonder what will be the future of the country—whether in another twenty years it will be in the same uncivilized state as it now is, or whether sufficient reason will arise for opening it up. These hills, it must be remembered, are peculiarly situated. They separate two countries, Assam and Tibet, from one another; the distance from the plains of Assam to the border of Tibet is less than 50 miles in a straight line and 110 by road, the whole route lying through a country occupied by a quiet, peaceable people, who at present look to us as the paramount power, and from whom we may expect nothing but obedience; a people amongst whom no trace of Tibetan influence is found. With the awakening of China, how long these conditions will continue is a subject that I cannot touch on here. An effort to take advantage of the present situation should, I think, be worthy of consideration from a commercial point of view. To connect India with the borders of south-east Tibet by a good mule-track as a beginning would be easy, could be carried out at no great cost, and should attract trade. The attention of the Calcutta Chamber of Commerce was drawn to a trade route from Assam to Tibet over forty years ago by Cooper, who went up to investigate. He met with failure, but in those days the hill tribes were unfriendly, which made all the difference. The country itself presents no difficulties; it is, in fact, a strikingly easy one for a mountainous tract. The highest altitude is met with when crossing the outer (or first) range, and even here we have to face only an actual rise of 4600 feet, after which no high altitudes obstruct the way. The banks of the river would appear specially formed for a road; large flat tiers running parallel to the Lohit, with easily surmounted spurs extending to the river itself, rising gradually from 1200 feet at the Tidding, to 3100 at Sati, an ascent of 1900 feet in 70 miles. It is a natural highway into Tibet, and only requires the hand of man to render it easy and expeditious.

At present trade is infinitesimal. The imports which pass up to Tibet from Assam through Miju traders amount to little, and of Tibetan exports there are none. But would these conditions continue if an easy and fairly expeditious route existed? I very much doubt it. At present south-eastern Tibet, or the Rong, as the country is known, has no industries, because she has no incentive for the development of her resources. She is cut off from convenient marts on all sides. Thousands of maunds of wool are wasted annually simply because there is no market, and that not only wool of the ordinary quality, but also of the costly variety called bashm from which shawls are made. Were communications improved along the natural outlet and the line of least resistance, viz. the Lohit valley, facilities for export would be brought within the reach of all. Once the Tibetan learned that every pound of

wool had a marketable value in Assam, and that Assam could be reached quickly, comfortably, and safely, and that there he could purchase tea, clothing, etc., in return for his wool, commercial interchanges would be assured, and both countries would benefit to a considerable extent. Trade intercourse just now is impossible, as Tibet is a forbidden land to the trader. But a good bridle path from the limit of British territory to Sadiya, a place in close proximity to the terminus of the Dibru-Sadiya railway, would attract the Tibetan to trade with us.

Events have been taking place of late which are likely to increase interest in this section of the Lohit valley. I refer to the Sinification of Tibet, and if reports in the public press be true, it is only a matter of months, not years, before the Rong, instead of forming a part of Tibet, will become a Chinese province. Assam will then be separated from China by only 50 miles (in an air line) of mountainous country, which can be traversed with ease.

How this is likely to affect affairs it is difficult to say. The Chinese colonist may under orders prevent all intercourse between the "foreign devils" and the Tibetans. Or if left to his own devices, we may find him keenly alive to the advantages accruing from easy communications with Assam. Sir Thomas Holdich, in 'Tibet, the Mysterious,' draws a picture of the Tsangpo valley with a railway and Gyala Sindong with a hotel. Why not, then, a railway running up the Lohit towards Sechuan? A railroad as far as Rima is practicable, but from there the country is difficult. The Tila La and two other high passes have to be surmounted, and the Salween, Mekong, and Yangtse to be crossed—at first sight a formidable array. But then we must remember that the altitudes of these passes do not represent their heights above the surrounding country. The altitude of the country itself is 5000 feet or more, which substantially reduces the height to be encountered. Again, the rivers are not the enormous rivers we know them to be further south, but at the points crossed are confined within narrow limits with a rock formation suitable for bridge foundations. But however costly, were there facilities for quick communication between India and Western China, the possibilities of commercial expansion would appear to be boundless. Given a railway, every ton of our exports for Sechuan would be captured for this route instead of being carried a long sea voyage from Calcutta, only then to commence the difficult journey up the Yangtse. With such improved communications, the resources of Sechuan, one of the wealthiest provinces of China, would develop enormously; with an easy and expeditious route, there is no reason why the Chinese coolie should not seek for employment on the tea gardens of Assam, and so possibly solve some of the present labour difficulties. The prospect of forging the link connecting India with China may be visionary, but, again to quote Sir Thomas Holdich, "it is not more visionary than twenty-five years ago was that of a modern hotel at the Victoria falls of the Zambezi."

THE MONGOLIA-SZE-CHUAN EXPEDITION OF THE IMPERIAL RUSSIAN GEOGRAPHICAL SOCIETY.

By Captain P. K. KOZLOFF.

In the summer of 1907, the Imperial Russian Geographical Society, with the approval and assistance of His Majesty the Czar, organized an expedition to Central Asia, entrusting it to me from its commencement. My companions were the geologist A. A. Chernof, the topographer Staff-Captain Napalkof, and S. S. Chetyrkin, botanist and entomologist, besides ten men to prepare specimens, take meteorological observations, etc., and to act as a guard.

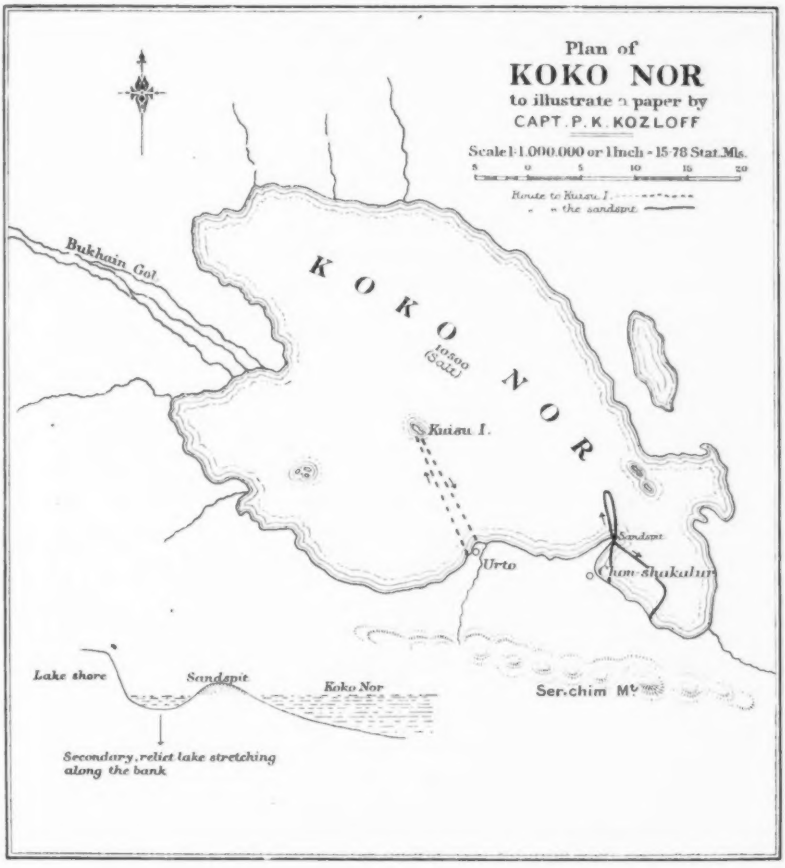
The object of the expedition was to explore parts of Mongolia not yet visited by Europeans, to take soundings of the alpine lake Koko-nor, and to investigate the region of the upper course of the Huang-ho, where it winds among the mountains.

The expedition started excellently equipped from St. Petersburg, and on November 22 left Moscow. Though the year was drawing to a close, my compatriots flocked to the station to see me off—relations, friends, acquaintances, comrades of the Ekaterinoslav Guards, and our journey commenced to the strains of the Ekaterinoslav March. The railway journey of ten days and a couple of days' ride in a Siberian carriage soon passed, and we found ourselves on the borders of the empire at Kiakhta-Dvazhda, and were kindly welcomed by old acquaintances.

Beyond Kiakhta begins Mongolia, at first a steppe country, but mountainous beyond, with ranges more or less massive, rich in animal and vegetable life. Then comes Urga, the Mongolian Lhasa, beyond which the character of the country rapidly changes, the surface becomes more even, the vegetation is poor, the population scanty, especially south of the mountains constituting the eastern prolongation of the Mongolian, or Gobi, Altai. There is the actual desert of Gobi, here taking the form of even slopes of sand and stone, there moulded into smooth or rocky hills, on the top of which at even the setting sun casts picturesque gleams. In fine, southern Mongolian presents almost everywhere a sea of arid sand, but in many parts occur meridional sand-dunes, not infrequently rising to a height of 100 feet or more.

The native inhabitants of Mongolia, the Mongols, also vary with the physical conditions and the predominance of their own chiefs or of the Chinese. In Northern Mongolia the traveller meets with nomads still priding themselves on their traditional boldness and courage, their many-coloured garments, their lively hacks, their ornaments, their dexterous horsemanship, their cunning; these Mongols carry one's thoughts back to the time long gone by, when they had a history of their own. The maintenance of the independent condition of the

Mongols is promoted to a great degree by the Bogdo-gegen of Urga and the ruling authorities of the tribes, the Mongolian princes, whom the Chinese treat courteously, striving to attach them to the court of the Bogdykhan (Emperor of China). The Mongols of the central parts of the country are markedly inferior to their northern neighbours,



but, on the other hand, are often superior to the inhabitants of the south, who are becoming ever more and more assimilated to the Chinese, both outwardly and inwardly. Among these people the national life is forgotten, the racial feeling is disappearing. On the whole, judged from our standpoint, the Mongol passes his life in a miserable, unenviable environment, and his mental horizon is limited, though he is

distinguished from his nomadic neighbours by having attained a comparatively higher intellectual development; has his own literature and printed laws, learns to read and write Tibetan, studies religious questions—has, in fact, some slight conception of culture; but, after all, the nomad, according to European ideas, represents a low, effete stage of social development.

In crossing Mongolia in various directions, and observing and studying different sides of its simple but original character, I was far from expecting to find a dead, forgotten city, such as the expedition actually came across in the lower basin of the river Etsin-gol, which rises on the northern slopes of the mighty Nan-shan. The lost, deserted city Khara-khoto, or Baishen-khoto,* now stands 8 to 10 miles east of the most easterly branch of the Etsin-gol. The "Black City," or rather its ruins, were well known to the Etsin-gol Torguts, who migrated thither from Kobuk-saire-Dzungaria about four centuries ago, when the banks of the Etsin-gol were still clothed with virgin forest, impenetrable in parts, which the Torguts burned down during the first three years to make room for their encampments and pasture. According to the present Torguts, their ancestors found the ruins just as they are now—that is, a town of the Chinese type, with high clay walls facing the cardinal points, placed on a rather high abrupt terrace, which was at one time washed by the Etsin-gol flowing past to the north-east. The remains of the channel can be traced the whole distance from its head at Botok-deerek to the salt sandy basin Khodon-khoshu, lying in a line with the existing basins Gashun-nor and Sogo-nor. At some distance before reaching Khara-khoto we were much interested in the *suburgans*, or tombs, standing singly or in groups of two to five along the road which leads to this historical monument, and overwhelmed with sand from the neighbouring desert. Two miles further the city itself came into view, its principal *suburgan* rising above the north-western angle of the fortress, from among a number of smaller neighbours erected by the wall and in a line with the wall outside the fort. The explorer approaching Khara-khoto from the west notices a small building with a dome-shaped roof standing at some distance from the south-western corner of the fortress, and somewhat resembling a Mussulman house of prayer. The walls of the town are covered with sand, in some places so deeply that it is possible to walk up the slope and enter the fortress. A few minutes more, and we passed into the dead city by the western gate, placed directly opposite the other remaining gateway in the eastern wall. Here we found a quadrangular space,† whereon were scattered high and low, broad and narrow, ruins of buildings with

* Khara-khoto and Baishen-khoto are the Mongolian names signifying Black City and Fortress City.

† A side of the square measures about a quarter of a mile.

rubbish of all kinds at their feet, including a heap of fragments of clay and china pottery. Here and there stood tombs. We at once divined the interest with which our labours would be rewarded in the investigation and excavation of all that now lay around us.

Our camp was pitched in the middle of the fortress beside the ruins of a large two-storied building, to which adjoined, on the south side, a temple ruined to its foundations. Owing to the absence of water on the spot, we were obliged to carry with us all our vessels filled with water, that we might remain as long as possible at the ruins. Before an hour had passed, the interior of the fortress had come to life again. Men moved about, tools were at work, dust rose into the air. About the bivouac was the desert bird, the chough-thrush (*Podoces Hendersoni*), chattering loudly as it perched on the twigs of the saxaul; it was answered softly by the sweet singer of the desert, the whinchat (*Saxicola*). Interesting occupation made the time pass quickly and imperceptibly. The dull grey and generally windy day soon gave place to a calm clear night, in which the ruins seemed stern and gloomy. Being tired we soon fell asleep, but some of us were disturbed by the unpleasant voice of the owl (*Athene*) screeching ominously from the top of the principal *suburgan*.

During the few days spent at the ruins of Khara-khoto, the expedition gathered all kinds of articles—books, letters, documents, coins and paper money (assignats of the Min dynasty), female ornaments, some household utensils, ordinary articles of trade, objects of the Buddhist cult, etc. The quantity collected was enough to fill ten chests of 36 lbs. each, which have been forwarded to the Geographical Society and the Academy of Sciences. On the return home of the expedition we shall be able to learn positively when the "Dead City" existed and who were its inhabitants.* From the slight legendary lore handed down from generation to generation, the Torguts of Etsin-gol who accompanied us to the ruins communicated to us information of no little interest. The native tradition runs as follows: The last ruler of Khara-khoto, the *batyr*† Khara-tsian-tsiun, relying on his invincible army, designed to take possession of the throne of China, and consequently the Chinese authorities were obliged to send a considerable force against him. A series of battles took place between the imperial forces and those of Khara-tsian-tsiun to the east of Khara-khoto, about the present northern boundary of Ala-shan in the Shar-tsa mountains, and were unfavourable to the latter. Having got the upper hand, the imperial army forced its

* Captain Kozloff has, since writing the above, received a letter from A. V. Gregorief, vice-President of the Russian Geographical Society, informing him that the manuscripts and other articles forwarded to St. Petersburg show that Khara-khoto must be identical with Hsi-hsia, the capital of a Tangut kingdom which flourished from the eleventh to the fourteenth century.—Ed.

† A Mongol word meaning a valiant man, a hero.

enemy to retire, and finally to shut himself up in his last refuge, Khara-baishen, which was blockaded on all sides. Whether the siege was prolonged is not known, but, at any rate, the fortress was not taken at once. The imperial army, being unable to take Khara-khoto by assault, determined to deprive the beleaguered city of water, with which object they diverted the river Etsin-gol, which, as mentioned above, at that time washed the wall of the town, to the left, that is westwards, blocking up the original channel with bags of sand. And to this day there are to be seen remains of this dam, in which the Torguts not long ago found remnants of bags.

The besieged then began to dig a well in the north-west corner of the fortress, and sank it down to 80 *chokan*—a *chokan* is more than 11½ feet—and still did not find water. Then the *batyr* resolved to meet his enemy in a last general engagement, but, in case of defeat, he buried in the well, before it was filled in, all his treasures, which, it is said, filled no fewer than eighty wagons or carts, each holding 600 to 900 lbs. weight; and this consisted of silver only, and did not include other valuables. He then killed his two wives, and son and daughter, that the enemy might not abuse them. These preparations completed, he ordered a breach * to be made in the northern wall, near the place where his wealth was hidden, and through it rushed on the enemy at the head of his troops. In this decisive action he perished, and also his army, hitherto considered invincible. The imperial army, as usual, destroyed the captured city utterly, but did not discover the hidden treasure, which, it is said, lies there still, though the Chinese of the nearest towns and the local Mongols have tried more than once to get possession of it. They attribute their failure wholly to a spell worked by Khara-tsian-tsiun himself. The natives are more convinced of the efficacy of this potent spell since the last time they searched, when instead of treasure they found two large snakes brightly glistening with red and green scales.

After its work at the ruins of Khara-khoto, the expedition followed the historic road to the residence of the Alasha-tsin-van, the town Dyn-iuan-in, and then made somewhat extended excursions into the Ala-shan range and the adjoining valley of the Hoang-ho before proceeding to the Nan-shan and further south. In Dyn-iuan-in we established a depôt and a meteorological station of the second class, which was in working order from the beginning of May, 1908.

Here ended the first period of the expedition's activity, and the second lay before it—the Koko-nor period.

On October 15, 1908, the expedition came to the Hui-dui oasis, where it was accommodated in the Chinese temple, Viu-tsy-miao, beautifully

* This can still be seen.

situated on the heights bounding the oasis on the south. Three months had passed since we left Alasha-yamyn, and in this interval we had visited the burning desert of south Ala-shan, the eastern Nan-shan, and the high alpine lake Koko-nor—had, in fact, accomplished the second part of our programme. We happened to be among the Ala-shan sands in the very hottest season, in the Nan-shan at the time of the development of vegetation and animal life, and at Koko-nor under the best weather conditions, comparatively speaking.

The heart of Koko-nor, its mysterious island Kuisu, was visited. This event made a great impression, not only on the Koko-nor natives, but also on the Chinese of Sinin—so great that both conceived it possible that we had subdued the dragon of the lake; that the water retired before us, and we marched along the bottom, caught a golden fish, etc.

LANDSCAPE IN CENTRAL MONGOLIA: MONGOL ENCAMPMENT.

At any rate, it is certain that both Chinese and Tanguts began to treat us with greater respect and attention.

Uninterrupted rain for the space of a week delayed the departure of the main caravan from Dyn-iuan-in till July 18.* The noise and bustle of the town gave place to the deep silence of the desert. The air, purified by the rain, had become clear, and it was possible to trace on the one side the outline of the Ala-shan range, on the other a sandy plain stretching far away to the western horizon. The route of the expedition crossed the desert at its narrowest part, from Dyn-iuan-in to Sa-yan-tsin, in a south-westerly direction, leaving on the east a wedge of sandy waste that extends to the undulating heights on the left bank of the Yellow river. Our caravan consisted exclusively of camels, to the number of thirty, which travelled easily over the cracked sandy ground. At our feet lizards scurried about, beetles crawled everywhere, flies swarmed, buzzing as usual; butterflies were less

* The eastern detachment, under Captain Napalkof, left the town on July 11; the western, under the geologist M. Chernof, on July 14.

common. A great scarcity of birds was remarked, and still scarcer were the mammals of the desert; occasionally the profile of a swift-footed antelope appeared for a moment on the summit of a hilly ridge or sandy mound. Oppressively monotonous and wearisome is the desert in summer. At night, indeed, one feels pretty comfortable, but as soon as the rays of the summer sun appear the heat becomes unbearable, crushing all one's energy. Even the famous ships of the desert become heavy and stupid in the very hottest season. Again and again you look at your watch, straining your eyes to catch sight in the distance of the green spot that is to afford a resting-place for the caravan beside its well. In order to cross the desert with greater ease, especially where there were long stretches without water, we usually left the wells after dinner at two or three o'clock, and travelled till dusk, then unloaded the caravan beside the road, and, after taking some refreshment, immediately lay down to sleep. As soon as the morning dawned the caravan was ready to start, and tried to reach as soon as possible another halting-place with water.

The first half of the sands we traversed under a burning sun, far from feeling the full "charm" of the desert. The sand was heated almost up to 158° Fahr., and burned our feet through the thin soles of our shoes. The poor dogs suffered more severely than ourselves, in spite of the great care and precautions of Sergeant-Major Ivanof, who every half-hour took down a trough from the baggage, and sparingly watered them. The dogs knew all about it, and at the proper time ran, without being summoned, to the front and fawned upon Ivanof.

The sand-dunes (*barkhans*) were piled one on the other, higher and higher. The camels strain at the leading-reins, and breathe heavily as they ascend to the top of a dune and then descend to its base. The broad hoof of the camel falls softly on the sandy surface; the curious sound it emits is hardly heard, being overpowered by the breathings of the troop. On ascending a high sand-dune we have always the same view—sand, sand, sand. Our mouths are parched; the dryness of the desert air is extreme. The expedition rested quite twenty-four hours at Shirigin-gol, where in one of the small lakes, or rather pools, we bathed several times, vainly seeking coolness.

We were fortunate in crossing the second half of the desert, the Tengeri sands, when the sky was overcast. Dark storm-clouds swept up from the north, rain fell, and the air became fresh and pleasant. In such weather the sands were no difficulty. The camels left barkhan after barkhan behind, and at length passed the sacred *obo*, erected, according to tradition, by the Buddhist prelate Bangen-bogdo, who opened this road. In memory of the great pilgrim and his opening up of the road, the appropriate name of Tengeri, *i.e.* Celestial, was given to this sandy waste. Beyond the sands the road soon passes through hills of argillaceous stone, and then comes to a mountain ridge, a northern

offshoot of the eastern Nan-shan, crossing the scarcely perceptible remains of the Great Wall at the small decayed town, Sa-yan-tsin, the residence of the Chinese custom-officer. There, for the first time after leaving Dyn-iuan-in, we found good water. A dense agricultural population extends thence right up to the little town Shara-khoto, near the pass of the same name, where the basin of the Koko-nor begins—a country well suited for nomadic life.

Every day we advanced along the eastern Nan-shan the air became more transparent, the sky bluer, the vegetation more luxuriant and greener. Behind us, to the north, clouds of dust rising above the plain reminded us of the desert. From the Chagryn steppe, from the town

DYN-IUAN-IN (NORTH-WEST ANGLE OF FORTRESS): CARAVAN ON THE MARCH.

Sun-shangen,* we could already admire mighty mountain chains, especially to the south-west, where the impetuous mountain stream, the Tetung, hides itself, which was visited more than once by my never-to-be-forgotten instructor, N. M. Prjevalsky. More to the east, along our road, beyond the town Pin-fan, rocky chains sloped down, dividing into secondary ridges, which were covered from top to bottom by the tilled fields of Chinese. Not long ago, comparatively, the land there was waste, a memento of the terrible Dungan insurrection; to-day it is almost all occupied; there is absolutely no free, uncultivated spot that is suitable for tillage.

* In this town we stayed in a small Buddhist monastery, presided over by the amiable *gegen* Nian-gokik, who had erected a very fine temple at his own expense. We soon became intimate with this priest, for he and I had many friends in common—senior lamas of Nan-shan monasteries. At parting we exchanged presents, the priest giving me an excellent metal figure of Tsagan-darkhe, the White goddess.

The first stream of importance on our route was the Churmyn-gol, the second the Tetung, and the third and last the Sinin-ho (with the little town Lo-vachen) with its tributaries. Along the valley of the last we turned sharply to the west, and, gradually ascending, passed beyond the region of cultivation. We crossed the Churmyn, which divides into arms, without much difficulty by a ford at the town Pin-fan, where we found good camping-ground close to the wall. On the larger and more impetuous Tetung there is a ferry-boat, unfortunately with a rather high deck, rendering it troublesome to get the animals on board and off again. The river Sinin-ho, along which runs a much-frequented trade route, Lan-chou-fu to Sinin, was spanned by some hunch-backed bridges. The valleys of all these three rivers, like the mountains that confine them, run from north-west to south-east, and bear the same character; their water helps to fill the main drainage artery, the Hoang-ho.

This eastern section of the Nan-shan has a different character to that of the more western districts, where not only the central, but also the lateral, ranges exhibit crystalline outcrops in the form of sharp summits, peaks or great cliffs rising one above the other in picturesque, enchanting grandeur. Here the traveller can, with comparative ease, reach the summits of the passes with a caravan of camels, or in a Chinese cart drawn by horses or mules, for loess predominates everywhere, overlying for the most part Han-hai deposits, Han-hai red sandstones, and limestones or siliceous schists occur only in small quantities. The carriage-road is deeply sunk in the layers of loess, and the surface is cut up by trenches very troublesome to travellers, and in some places impossible to avoid.

The towns and inhabitated places in general on the route of the main caravan do not differ essentially from other towns of Western China well known from the reports of former travellers. Here, too, the towns are enclosed in walls of stone or clay, and here are collected officials, traders, soldiers, artisans, etc. Here also the Government buildings and the bazaars are full of natives during the day. It may safely be asserted that Chinese towns have from times long past been constructed, and are still constructed, on one plan; having thoroughly examined one or two inhabited places, one can form a correct idea of the others. The only variations are the extent of the town quarters and the strength and solidity of the walls.

At the time of our journey in the Nan-shan, at the end of July, the grain harvest had commenced in the valleys and on the lower and middle belts of the adjacent mountain slopes. The fields were alive with natives, both men and women taking part in the work. Broad straw hats protected them from the scorching rays of the sun. The villages, as with us at home, were deserted by old and young.

Towards the middle of August the expedition came to Sinin, and

pitched its camp on the eastern side in the little hamlet Tsav-dia-tsai. The animals were hard up for pasturage; we had to put them on dry fodder and deprive them of their usual liberty of movement.

Sinin * is a large provincial capital with the residence of the Chinese dignitary who exercises authority, not only over the nomads of Koko-nor, but also over those of extreme north-eastern Tibet. To get all my business in Sinin done as satisfactorily and quickly as possible, I, with two interpreters, moved into the city, where I found lodging with the Chinese trading firm Tsian-tai-mao, known to me during my former Tibetan journey. In the course of the three days I spent in Sinin, I was able to settle all questions definitely. The Chinese officials received

TOWN OF SININ, TAKEN FROM THE TEMPLE, WHICH STANDS ON THE SOUTH-SOUTH-WEST OF THE TOWN.

me very pleasantly, and professed themselves ready to assist me in my projected visit to Koko-nor, though they all with one voice declared, "You know that the times are changed; that many Tanguts and Tibetans are armed with quick-firing rifles; that these savages collect more frequently than formerly into robber bands, attack caravans, and mercilessly pillage them. Pray do not go to Koko-nor. The Tanguts will not leave you in peace, and unpleasantness will arise which will give us all no end of trouble." The Tsin-tsai went still further. In the course of a long conversation, he heard from me that we intended

* Founded, according to Chinese annals, 2225 years ago, consequently in the year 317 B.C.

to navigate Koko-nor, and for this purpose were provided with a folding canvas boat. The Chinese official almost jumped off his chair, and, raising his voice, declared that this was folly, for the water of Koko-nor was peculiar, not only stones, but even wood sinking in it. "Try it yourself, and you will see. Besides," continued the Tsin-tsai, "at the present time there is no one on the island Khaisin-shan;* the pilgrims flock to it only in winter." For my part, I thanked the honourable official for his kind attention, but could not refrain from telling him that I was now more determined than ever to visit Koko-nor, to convince myself of the truth of this singular property of the water of drawing dry wood to the bottom. Thereupon the Tsin-tsai said, "Very well, I will do everything to facilitate your journey to Koko-nor. I will write to the tribal chiefs; I will provide you with an escort; but I beg you to hand me a paper, stating that you are going in spite of my warning and polite remonstrances, and that you will be personally responsible for any troublesome consequences that may ensue." Being familiar with written declarations of this kind, I this time also complied with the demand of the obstinate official, who kept his word in supplying me with an interpreter knowing the Chinese, Mongolian, and Tibetan languages, and with four mounted troopers, who soon made friends with my grenadiers and cossacks.

As regards the information given by the Sinin officials about the greater audacity and activity of the Koko-nor and other Tibetan robbers, and of their possessing quick-firing rifles, this we ourselves had opportunities of learning, having noticed large or small parties of Nan-shan Tanguts bearing across their shoulders German, more frequently Japanese, and occasionally Russian, rifles. Seeing the wild energetic nomads sweeping past on their mettlesome horses, we reflected that in no distant future these free sons of the steppes of Koko-nor and Tibet would become formidable to the Chinese Empire. This the Chinese of Sinin recognize, and they recognize their own present helplessness and the absolute necessity of training and arming their troops before long after the European model.

My affairs in Sinin being settled, I sent off the caravan by the direct road to Donger, turning myself, with the Cossack Badmazhanof, southwards, with the object of visiting the great Amdos monastery, a day's journey from Sinin. Gumbum is hidden among high hills of clay and loess, immediately adjoining a very lofty alpine range, the southern foot of which is washed by the rapid waters of the Yellow river. The Gumbum monastery was founded five hundred years ago by Bogdo-gegen, who afterwards made a pilgrimage in Tibet, to Lhasa, where he fixed his permanent residence. The monastery he founded came

* That is, "New mountain of the sea;" so the Chinese name the island Kuisu. The latter word is Mongolian, and signifies "navel."

under the control of the Acha-gegen, supposed to be now in his fifth regeneration.

In the twelve temples are said to reside sixty-three *gegens*, presiding over a confraternity of fully two thousand men. There are four principal temples, which were saved from destruction by the Dungans by the forces of the monastery—young fanatical lamas, who fought splendidly, gun in hand, against the daring foe. The solid ancient temples glitter outwardly with gorgeous gilded roofs, and within are abundantly

THE TSIN-TSAI OF SININ.

decorated with historical images of the best Mongolian, Tibetan, and even Indian workmanship. Especially magnificent and revered is the temple called the Golden Tomb. Before this temple, the worshippers, prostrating themselves and moving their hands and feet from time to time, have worn in the boarded floor of the porch large holes, in which they can easily place the toes and hands when prostrating themselves at full length. The large cathedral temple is also preserved in good condition, and is capable of holding five thousand worshippers. On

entering the porch I caught sight of seven stout whips hung on the wall. These whips, as I was informed by the local inhabitants and the older lamas, only keep up the long-established rule of the monastery for novices. Rich and beautiful also is the temple, standing beside eight white tombs,* according to tradition on the spot where is concealed in the earth the placenta of the child which afterwards became the famous reformer of Buddhism, Tson-khava.

In Gumbum are carefully preserved relics, such as the raiment of a Dalai-lama, Bangen-ergen, Tson-kava; also the carts of the Dalai-lama and Bangen-ergen, the hat of the reformer, and the saddle of a Bogdykhan with the dragon quivering on the bow.

All the time I was in Gumbum, the head of this monastery, the Acha-gegen, was absent on an extended tour to the East—Peking and Japan. According to information obtained from the inhabitants of the neighbourhood, the Acha-gegen sides with the Japanese. The latter call at this monastery from time to time, and on particular occasions, as, for instance, during the presence of the Dalai-lama, stay there for a long time—a year or more—under the pretence of learning the Tibetan language.

I left Gumbum early in the morning of August 18, and in the evening of the same day reached Donger, where an island between the arms of the river on the southern side of the town was whitened by the tents of the expedition. The caravan had arrived only the day before my return from Gumbum. As the governor of the town had received timely notice of our expedition, we received nothing but kindness and attention from him. The members of the expedition could wander freely through the town, enter at will the stores and shops, and felt themselves generally at home. In this market town the streets were crowded with Koko-nor Tanguts. The young ones compelled notice by their bright dress and the singular decoration of their backs, consisting of ribbons in twos or threes richly trimmed with coins, shells, turquoise, etc. Still more animation was lent to the streets by the Tangut horsemen careering along fully armed. The proud and haughty steppe-dwellers fear nothing and no one, but rather, on the contrary, inspire the Chinese inhabitants with fear and humiliation.

Rain again delayed our departure for some days till August 24, when at length we continued our march. On the third day, from the summit of the Shara-khoto pass, we joyfully greeted the soft blue surface

* The tombs of eight *gegens*, put to death here by order of a Chinese prince notorious for his cruelty and severity in the exercise of judicial functions. This prince was despatched to Gumbum by the Bogdykhan to reduce the rebellious Tanguts. The prince charged the eight *gegens* with being the instigators of the revolt, and said to them: "You that are born again know all things, not only the past and the present, but also the future. Tell me when you will die." "To-morrow," they replied. "No, you are wrong; it will be to-day;" and he ordered their heads to be cut off at once.

of the Koko-nor, stretching away to the west. To the south mountains were crowded together, among which the rocky summit of Ser-chim was conspicuous, silvered over with fresh-fallen snow. This stands near Koko-nor, and farther off, in the same southerly direction, a still grander range lifts itself proudly to the sky, reflecting a dull whiteness from its thick mantle of snow. A solemn calm reigned in the marvellously transparent atmosphere; the sun made its heat perceptible; in the clear blue vault of heaven the feathered denizens of the kingdom of the air hovered here and there—the Himalayan griffon, the black vulture, and the bearded lammergeier; the last seldom approached near enough for

GUMBUM MONASTERY FROM THE SOUTH-EAST.

us to admire his stately flight, particularly grand when, without moving his wings, he soars or glides along the mountain.

The next day, August 27, the expedition reached the shore of the alpine basin, and Koko-nor smiled on us with still greater charm. Before us spread its azure surface slightly agitated by gentle undulations, which from the first day lulled us to sleep with their monotonous murmur. In calm clear weather Koko-nor was simply enchanting. This imposing sheet of water seemed to us all more like a sea than a lake. Its really grand dimensions,* its surface stretching beyond the horizon, the colour and saltness of the water, the depth, the high waves,

* Koko-nor has a circuit of about 230 miles.

and at times the heavy surf, conveyed the idea of a sea rather than a lake. We from the first to the last day of our stay there spoke of it as such. The bathing in Koko-nor was excellent; we bathed several times a day. Floating easily on the water, we could swim to a considerable distance, and then giving ourselves up to the power of the waves, reach the shore again. The transparency of the water was so great that the sandy bottom and the fishes swimming over it could be plainly seen at a great depth.

But if Koko-nor was beautiful by day, at eve, especially in fine weather, it was truly bewitching, as it was on the day of the arrival of the expedition on its bank. The sun, having finished its daily journey, was sinking to its rest, its rays lighting up the mountains and spreading over the visible horizon and being reflected from the bosom of the water. A transparent feathery cloud, like golden lace, moved slowly southwards. Yonder on the mountains perfect stillness prevailed, and Koko-nor became calm; it no longer blustered and beat heavily on the bank, but gently whispered to it.

On the following day our camp woke up when the dawn had just appeared in the east. Ser-chim still slept veiled in cumulo-stratus clouds that reached down to the shore. From the lake geese cackled, snipe screamed and whistled in various tones, and the white-tailed fish-eagle uttered its call; in the meadows the lark awoke and began to rise aloft, singing as it went. The caravan was in motion along a soft beaten track. The rays of the orb of day played on Ser-chim; the clouds, wanderers of the sky, rose upwards and melted away. After an hour the first sharp gust of wind rushed upon us, quickly followed by a second and third. Koko-nor knit its brows.

We followed the southern shore, meeting occasionally Tangut caravans of yaks. The nomads were moving from one side of the valley to the other, from the western to the eastern, where lay rich pastures still untouched. Finally, the island Kuisu, the centre of attraction to us, showed itself. From the meadowland sloping to the shore, where our caravan was now travelling, we could see a still greater expanse of blue and azure water than before. Kuisu, like a gigantic war-ship, rose from the dark-blue waves and allured us by its mysteriousness.

It may be remarked that Koko-nor is drying up year by year, its level is sinking, and the line of its banks is shrinking. Native observers, especially former inhabitants of the district—Mongols—assert that Kuisu is increasing in size; that long ago, as the old men say, this island was scarcely noticeable, whereas now it appears quite as a mound.

On August 29 the expedition pitched its camp at Urto, the nearest point to Kuisu on the southern shore, where it remained about three weeks, enjoying the full and unrestrained life of the nomads 3 miles

away from us. To the north, half a mile distant, lay Koko-nor; to the south, 4 miles off, stretched the mountains, the western prolongation of Ser-chim. From the mountains flowed a stream, traversing a valley slightly sloping to the lake and entering a secondary or partially enclosed basin along the shore, 1½ mile in circumference. On a third raised beach by the same stream, continuous with the mainland plain, we had our camp, whence we enjoyed an extensive view on all sides. The swift clear brook enlivened our bivouac, winding round it on three sides. About the brook, and still more on the neighbouring lake, geese, ducks, and widgeons were constantly flying. On the sandy shore

THE TOWN OF DONGER FROM THE SOUTH-WEST.

of the lake itself sat cormorants and gulls in small and large flocks and solitary fish-eagles.

On arriving at Koko-nor we took out our folding boat, and, having put it carefully together, commenced making trial trips to a distance of 2 miles and more from the shore.* We boated in all kinds of weather, when Koko-nor was stormy and calm. On the whole, the result of these trials was satisfactory. The boat swam on the water like a cork, obeyed the helm, and was fairly easily steered in any direction. It had, however, its bad qualities. On the first day the rudder and the fastenings began to get loose, the fastenings parted,

* The depth of Koko-nor is almost a fathom at the shore, and it gradually increases with the distance: at two-thirds of a mile it sinks to 50 feet, and at 3 or 4 miles to 65 to 80 feet.

and, the sides of the boat opening, high waves fell constantly into it. Thorough repairs were necessary before we could have sufficient confidence in our craft to attempt the sail to Kuisu. A wooden strip laid along the sides strengthened the whole boat and kept the fastenings firmly in place.

Having tested the boat, we had to think of provisions, adjust sounding and other instruments, and decide who were to take part in the navigation. As a starting-point, a place was chosen about 4 miles to the west of our camp and 2½ miles from the *obo* on the bank, which serves as a landmark for the pilgrims who cross to Kuisu in winter on the ice.

Amidst these interesting occupations the first week of our stay at Koko-nor glided past imperceptibly. At this time Chernof returned from his excursion, having covered 560 miles. Crossing the Ala-shan desert from Dyn-iuan-in to Lian-chou-fu, he penetrated into the Nan-shan in the direction of the town Datunga, a region hitherto unvisited, and discovered some glaciers occupying ravines on the northern slope of the highest chain. Then he descended to the valley of the Donger-ho, and travelled by the caravan road to rejoin the expedition. The first days after his return he was engaged in setting in order his observations and collections. We, as before, were occupied with Koko-nor, daily observing the condition of the water, which was not the same at all times and parts. Thus, for instance, the south-eastern bay, calm and quiet, reflected the lovely azure shades of the sky when the northern part of the lake was agitated with waves of astonishing height, while dark high rollers tipped with foam swept up from the north-west. Koko-nor quickly changes from calm to rough, but takes a long time to settle down after a violent storm. Calm or agitated, Koko-nor is always exceedingly beautiful. I sat for hours on its shore, or walked at a distance up and down from our encampment, never tired of gazing at the boundless expanse of water, nor wearied of the monotonous splash of its breakers, which reminded me of the southern shore of the Crimea.

I decided to take the first turn in the voyage to Kuisu. All was ready, and in the evening of September 9, I and the orderly Poliutof moved to the landing-place. Koko-nor was peaceful; the sun set in a clear transparent sky; the barometer was high. Scarcely had the red of sunset vanished from the west when the moon rose from the east, illuminating all the visible surface of the lake. I was vexed that I had not made ready to sail for Kuisu a day sooner, that I might have taken advantage of the good weather. What would the morrow be?

Having had enough of wandering on the shore and enjoying the beauties of Nature, I turned to the tent to sleep. The sea also slumbered, and not a sound disturbed the absolute stillness; but at two o'clock in the morning I was roused by heavy waves beating violently against the shore. At dawn, when we had intended to start, the storm was

still more furious. At midday it began to abate, and we made several attempts to get away from the bank, but the tenth or twelfth wave forced us back again.

Returning to the camp, I proposed to my comrades Chernof and Chetyrkin, that they should go to the starting-point and patiently wait for smoother water. They were more fortunate than I. Going to the starting-place on September 11, they put off from the shore the next day at one o'clock, with the intention of proceeding perhaps halfway, if the lake did not settle down. However, as they advanced the weather improved; the wind dropped, and the waves became lower. Rejoicing in this circumstance, my companions put forth greater strength, with

SOUTHERN FLANK OF THE ALPINE CREST LYING BETWEEN SININ AND HUI-DUI: CHINESE TEMPLE NEAR VILLAGE OF CHAN-HU.

more hope of accomplishing their purpose. Five hours of heavy toil at the oars passed, and half the distance between the shore and the island lay behind, though the island still appeared of no great size. Another tedious hour passed, and the island seemed as far off as ever. The desire to reach Kuisu at all costs inspired them with fresh energy. Meanwhile twilight spread over the water quite unnoticed, and the wind rose, bringing with it a heavy swell. Every minute it became darker and darker, and the island vanished from sight. The high waves threw jets of cold water into the boat. The travellers had only their own strength to depend on, but their reserve of strength was being gradually exhausted. Working at the oars, they encouraged one

another with the idea that the island was near. Four trying hours passed, and suddenly, like a dark monster, Kuisu rose before them. Our travellers fortunately chanced on a smooth beach, where the boat could be put in; rocks stood to right and left. One can imagine with what delight my comrades landed at Kuisu. At the same time the clouds became thinner, the moon showed itself, and Kuisu stood revealed in all its beauty. Weariness, hunger, and cold (from wet clothes) were for the time forgotten.

My companions were on the water seven and a quarter hours altogether, never leaving the oars, during which they rowed 18 miles. The boat, being a third full of water, was too heavy for the travellers to drag ashore till the ordinary lading was taken out. Then they drew it on to the beach, and, turning it over, made a shelter for themselves. Having refreshed themselves with brandy, eggs, and tea, they tried to sleep, but their wet clothes made them too uncomfortable. They felt great chilliness, a premonition of fever, so they set off to wander over the island in the direction of the *obo* and shrine, the situation of which was very well known to them from numerous observations from the shore with a field-glass or in astronomical work. On the way to the *obo* they fell in with a horse, which, neighing with alarm, quickly cantered away. This discovery was a welcome indication of the presence of people on the island. After seeing the *obo* and temple, they returned to the boat, but soon started off again, this time in the opposite direction, along the bank, where they came across a human habitation—a cave, surrounded by an enclosure, from which a flock of goats and sheep gazed with curiosity at the travellers. Fearing lest they should frighten some one, the two companions went on, and soon found a small empty cave, with a store of fuel (dung). There they made a fire, warmed and dried themselves, and at two o'clock in the morning fell asleep.

On leaving the cave in the morning, September 13, Chernof and Chetyrkin saw a thin whiff of smoke rising from a cave-dwelling about one hundred and fifty paces off. They went to the boat, and having got the kodak and presents which had been brought in case they were wanted, they set off to visit the unseen hermit. On approaching the cave, they heard the voice of the monk offering up his morning prayer, "Ommani padme-hum," *i.e.* O Treasure of the Lotus.* To give notice of their presence, Chetyrkin coughed loudly, when the invisible anchorite began to pray more fervently with raised voice, trembled, and began to break down. When the travellers entered the cave he was terrified, made a long face, shook, opened wide his eyes, and putting his fingers to his throat, repeated volubly, "Ter-zanda? ter-zanda?" *i.e.* What is to be done? what is to be done? The travellers tried as much as possible

* The lotus, according to Indian mythology, is the throne of the Creator, and is also a symbol of the world.

to pacify the anchorite; but he was a long time in recovering, and probably would not have come to his senses if the boat had not been pointed out to him, at sight of which he smiled, brightened up, and concluded that he had to do with ordinary men, and not such beings as his imagination had conjured up. The meeting with the other two anchorites dwelling on the island, Tangut lamas * like the first, passed off quietly, as they were already informed of the presence of Russians on Kuisu, and their companion was present.

OASIS OF HUI-DUI, TAKEN FROM THE TEMPLE VIN-TSY-MIAO, LOOKING NORTH-WEST: THE HOANG-HO IN THE BACKGROUND.

My colleagues spent four days on the island, exploring it and making acquaintance with the life of the monks. Kuisu lies almost in the centre of Koko-nor, a little nearer the southern shore, and stretches from west-north-west to east-south-east. It is composed of granite and gneiss containing biotite, exposed along the coast and the higher parts

* One of the lamas came from Labran, another from Gumbum; of the third we have no information.

of the island, but in other places covered with soil of sand and clay, which supports herbaceous vegetation. The relative height of the crest of Kuisu is 200 feet; the shore-line scarcely exceeds 3¼ miles, the length of its axis is about 1¼ mile, and its maximum breadth, about the middle, is a third of a mile. The island is especially rocky along the southern and western shores; elsewhere it descends to the lake in long gentle slopes. The vegetation is identical with that of the land along the southern shore of the lake. There are no springs or streams; the anchorites and their cattle satisfy their needs with rain-water collected in hollows made for the purpose.

Besides the temple and *obo*, erected on the highest part of the island, Kuisu is adorned with tombs, cave oratories, minor *obos*, etc. In the temple and caves are some interesting old idols. The chief occupations of the anchorites are the regular performance of religious rites, copying out prayers, and making numerous *tsatsa*—clay images of gods. They also attend to their flocks of sheep and goats, which number in the aggregate ninety head. Each monk lives in a separate cave, with a fold for his own flock. The animals graze together, but on returning from the pasture part into three groups, each going to its own home. The horse is common property. The monks store up abundant supplies of curds, butter, and fuel. They live exclusively on dairy products, with which they kindly regaled my comrades daily.

Eight foxes live on the island in the company of the monks and their flocks; there are probably also alpine hares and other smaller rodents. As for birds, the chief species were swimmers and waders—geese, ducks, widgeons, cormorants, and gulls, usually sitting on the rocky coasts or on the sandflats. There were always fish * near the shore basking in the sun. When the cormorants came down to the water these shoals made off, and the birds pursued them for a long distance. There, too, fish-eagles fished, perched here and there on the cliffs; a solitary specimen of the black-eared kite (*Milvus melanotis*), probably a passing visitor, was noticed circling above the caves or flying from one end of the island to the other. Repeated inquiries from the natives about the existence of fur-bearing animals in Koko-nor, as well as personal observations, led to no positive results beyond the information obtained from the Tao-tai (Governor) of Sinin that he had seen skins of animals caught in the Koko-nor waters answering to the description first given by V. A. Obruchef.

In winter there is a change in the monotonous existence of the anchorites, for then the pilgrims cross to the island on the ice. However, the ice cannot be traversed every year, being not compact enough, and intersected by numerous cracks. From the summit of Kuisu a fine

* It is interesting to notice that there are no large fish in Koko-nor; the finest specimens were not more than 28 inches in length, or five or six pounds in weight.

view is obtained on all sides. A small rocky islet towards the south-west looked very pretty, and a cape or peninsula on the west stood out clearly. My comrades could not see the northern shore at all, whereas the southern shore was quite distinct.

On September 17, after hourly barometrical and other meteorological observations, my colleagues left Kuisu and its hospitable anchorites, who invited their "first summer guests" and "first foreign visitors" to wait till winter and return to the shore over the ice more safely than in "that cockleshell," they said, pointing at the boat and shaking their heads.

On the return voyage four soundings were taken. The first, close to Kuisu, showed the maximum depth of the southern part of the basin,* namely, 120 feet; the second and third, about halfway across, showed the same depth of 115 feet; and the last, 3 or 4 miles from the shore of Koko-nor, agreed with the soundings taken while the boat was being tested, marking 80 feet, or a little more. The surface temperature of the water was 58° Fahr. The bottom, over a belt extending from 3 to 5 miles from the shore, was sandy, and further out muddy.

While Chernof and Chetyrkin were rowing to Kuisu, I made an excursion of 60 miles in the southern Koko-nor mountains. On my return to camp, Ivanoff† joyfully greeted me with the news, "Yesterday (September 13) a rocket went up from Kuisu." This informed me that our "cockleshell" (9 feet long, 2 to 3 broad, and weighing 72 lbs.) had reached the island with its crew. My comrades and I had arranged that from the time they left the shore a watch should be kept at the head camp, at nine o'clock in the evening, for the appearance of two rockets. The first rocket was to be fired on the day of their landing at Kuisu or the following day (as, indeed, happened); the second on the eve of their departure from the island. "The rocket flashed like a small snake of fire," repeated my constant attendant Ivanof. "Thank God!" I said; "now we must watch for our friends' second signal." On September 14, 15, and 16 I stood at the astronomical pillar, surrounded by my fellow-travellers, the Sinin Chinamen and the Mongol drivers of Ala-shan. On the last evening, punctually at nine o'clock, a streak of light flashed for a moment across the darkness of the night. Immediately the silence was broken by joyous voices, and the Chinamen and Mongols, who had not seen the first rocket, were especially noisy. Next day, about nine o'clock in the evening, when Koko-nor was beginning to lash the shore, and our hopes were getting faint, I heard the voice of my comrades as they neared the tent. Our delight was

* That is, supposing Kuisu to lie on the line separating the northern and southern parts of the basin.

† Sergeant-major of the escort of the expedition, who has shared with me many hardships and privations since the fourth and last journey of my regretted master, N. M. Prjevalsky.

unbounded. Questions and cross-questions followed, narrative and repetition, which formed the base of the description given above of the voyage to Kuisu.

On the return of my colleagues, the camp was moved 13 miles to the east, to the base of a peninsula or cape called Chon-shakalur (great penfold), which ends in a sandbank jutting out into the lake. From this sandspit Chetyrkin and the orderly Poliutof made two boat excursions, one 4½ miles to the north, and the other south-eastwards, returning by the shore, a distance of 10 miles. The former was in the open water of the lake, the latter in the south-eastern bay partly shut off by the promontory.* On the second excursion, about midway, an accident happened. The iron cross-ties of the boat broke, in consequence of which the edges parted, the fastenings came undone, and the boat suddenly rolled to one side. Struggling with a considerable swell, the boatmen could scarcely manage the boat, and hastened to run ashore.

With this our work at Koko-nor came to an end. I considered the second task of the expedition to be accomplished as far as lay in our power, and made preparations for our return to Sinin, which we reached by the former route on September 28. In Sinin we had the pleasure of meeting our companion N. Y. Napalkof, who had safely returned from an excursion in the eastern part of the Kan-su province. The route of Captain Napalkof's detachment included Dyn-iuan, Tsin-an, and Sinin, forming a triangle the sides of which were connected with places explored by our predecessors. My colleague visited a corner of Kan-su hitherto quite unknown, and put down for the first time on the map the names of nine new towns.

This time the Sinin authorities assigned to the expedition an excellent house specially reserved for distinguished visitors, standing in the centre

* Two soundings between the camp and the sandspit (1¼ mile) gave a depth of 36 feet; bottom muddy.

September 21, soundings to the north. Temperature at 11.45 a.m., of the air, 44°·6 Fahr.; of the water, 49°·1 :—

Depth at	1 verst (two-thirds of a mile)	from the spit,	23½	feet;	bottom sand.
„	2 versts	„	47½	„	sand and mud.
„	3 „	„	57½	„	mud.
„	4 „	„	56½	„	mud and weeds.
„	5 „	„	67	„	mud.
„	6 „	„	82½	„	„
„	7 „	„	85	„	„

September 22, soundings to the south-east of the spit. Temperature at 9.30 a.m., of the air, 43°·7; of the water, 45°·5 :—

Depth at	2 versts	from the spit,	74	feet;	bottom mud.
„	4 „	„	89	„	„
„	6 „	„	95½	„	„
„	8 „	„	96½	„	„
„	10 „	„	90	„	„
„	12 „	„	80	„	„

of the town. They met us, as we say, with outstretched arms. They were already informed by the interpreter and troopers, who reached Sinin the day before us, of all that we had done at Koko-nor, and how well the Koko-nor natives behaved to us; and, more than all, that we were all safe and sound, and none of us lost. The Tsin-tsai and other Sinin officials, when they saw us, could talk of nothing else but our navigation of Koko-nor and visit to the island, and all examined our boat with great interest, both when put together and taken to pieces, and also my colleagues, whose hands still bore thick callosities. At last the Tsin-tsai remarked, "You Russians have navigated Koko-nor for the first time, are the first to give me information about its depth, and are the first foreigners who have visited Kuisu or Khaisin-shan. I shall certainly report all this to Pekin." Not to endanger our excellent relations and weaken the good impression produced by every interview with the Sinin authorities, I thought it better not to refer to the former conviction of the Tsin-tsai, that not only stones, but also wood, sank in Koko-nor. The truth was self-evident.

In Sinin the members of the expedition had the pleasure of making acquaintance with the English family of H. French Ridley, who had lived there as a missionary for more than fifteen years. In the company of these amiable people we passed many pleasant leisure hours, reminded of the culture of Europe. French Ridley was also interested in our navigation of Koko-nor, and whenever an opportunity occurred led the conversation to this subject. Being an old inhabitant of Sinin, the friendly missionary gave me much valuable information about the district, and effectively assisted in the enlargement of our ethnographical collection by obtaining articles from the inhabitants of the place.

In Sinin, too, thanks to the general improvement of postal management in China, we received our letters fairly regularly, and could also dispatch our correspondence to our distant home. One always receives pleasant news and another unpleasant. So it was now. Chernof heard sad news from home, and was compelled to make an early start for Russia. On his way across Ala-shan, Central and Northern Mongolia, he would make geological and geographical investigations.

Taking advantage of Chernof's departure, I sent off to the *depôt* of the expedition at Alasha-yamyn seven baggage animals, chiefly laden with collections. For our further journey we exchanged camels for mules, which have a particular facility for travelling in mountains, but, on the other hand, require careful attention and plenty of grain fodder. A good mule carries, without much difficulty, a load of 220 to 250 lbs. equally balanced on both sides of the animal. As we did not try to curtail our baggage, the number of animals remained the same, namely, twenty-three, which, with eleven riding-mules, formed the caravan, and extended along a considerable stretch of road. The expedition left Sinin in two sections, starting at different times. The camel caravan,

under Chernof, left on October 9. The main caravan set out on October 12, and arrived on the 15th at the oasis Hui-dui, having crossed on the way a lofty alpine chain by the pass La-chi-lin, more than 13,000 feet above sea-level. This journey was enlivened by the passing of natives, travelling in one direction or the other. At this time, besides trading caravans and caravans laden with pears from Hui-dui to be sold at Sinin, the whole road was full of smart Tanguts repairing in motley companies to the monastery of Gumbum for a festival.

The oasis Hui-dui, which the expedition is to leave one day in the early part of January of the present year, is spread out over a wide part of the valley, on the right bank of the Hoang-ho. Two tributaries, which supply the agriculturists of Hui-dui with water and are fed by the southern mountains, divide the oasis into three parts—a western, central, and eastern. In the middle part, near the main river, is situated the town; on the southern border, the Chinese temple Viu-tsy-miao. On the borders of the other parts stand Buddhist monasteries, of which the most noteworthy is the monastery Gomba-sy, hidden among the woods of the south-eastern outskirts of Hui-dui. The native population of Hui-dui, numbering about 7000 to 8000 souls, consists of Chinese collected in groups in the interior of the oasis; Tanguts, only a fifth or sixth as numerous as the principal inhabitants, dwell on the outskirts near the mountains. Both peoples live on friendly terms, and often intermarry.

In autumn and winter the oasis is bare, and is of a dirty, dark, dull colour. It is very different in spring and summer, when a rich vegetation displays itself, and Hui-dui presents a harmonious emerald carpet, strikingly contrasting with the general yellow monotony of loess landscapes.

In conclusion, I wish to say a few words on the results obtained by the expedition during the second (Koko-nor) period. The chief caravan and two detachments traversed and surveyed 1600 miles of country, connecting its observations with three new astronomically fixed points, besides old ones. On all journeys meteorological readings were systematically taken, prominent points were determined hypsometrically, and collections were made—geological, zoological, and botanical, the last, however, only with the main caravan. These collections, the zoological in all its sections, constitute a full record of forms. In the ethnographical collection objects of the Buddhist cult are conspicuous, such as idols of metal or painted, *gau* or amulets, articles indispensable in the performance of religious rites, Tibetan books. This collection owes much to the valuable information and advice kindly given me at starting by our graduate S. O. Oldenburg. The expedition has also acquired a fair number of specimens of Chinese painting and photographic plates of views and types of the country passed through.

THE SWEDISH MAGELLANIC EXPEDITION, 1907–1909: PRELIMINARY REPORT.

By C. SKOTTSBERG, D.Sc., Leader.

VI. Overland from Lago Nahuelhuapi to Punta Arenas.

As I have remarked on several occasions, our expedition has profited very much from the very valuable assistance offered by the Chilean Government. We were not only able to carry out our investigations in less time than ever expected, but also to enlarge our working-field in a considerable degree. As, in the beginning of October, 1908, we were ready to return south with the awakening spring, one single excursion of our original plan was left, viz. to the Beagle channel. To spend all the spring and summer there would have been a mistake, and therefore we had to enlarge our work a little, taking care to put our new work in strict relation with what had been done before. During the last half-year we had often discussed the matter, and resolved, if possible, to return to Punta Arenas overland. Finally, we were able to arrange the economical side of the matter satisfactorily, and arrived at Puerto Montt in order to pack and send off the collections made during the winter. After this we travelled over the Cordillera to Lago Nahuelhuapi in the Argentine Republic, where we took up our headquarters in the little village of Bariloche. Here we bought horses, gear, and provisions, and also found time to make a couple of excursions.

On October 23 our caravan stood ready to start. It counted four members—Messrs. Halle, Quensel, and myself, and our old assistant from the expeditions in the south, Pagels, who again had joined us. We had the smallest number of horses ever used in Patagonia for a trip of any extent—ten and a mare, the inevitable "yegua madrina;" and I very much doubt that anybody in Bariloche expected us ever to reach Punta Arenas with those horses, especially as they were not even in very good condition. Each of us disposed of two animals, and the remaining three carried the cargo. It is clear that only the most necessary things could be brought along: some instruments, a Winchester, a kodak 9 × 12 with films, small bottles for plants and insects, etc., and sleeping-bags, a tent for two persons, and provisions for the first month, during which we could reckon on the hospitality of the farmers, allowing us to completely omit some articles.

Our plan was to follow the Cordillera, passing close to the great lakes, and using the passes between the mesetas and the main range. The region we thus intended to explore is known only from the work of Prof. Steffen and the members of the Argentine-Chilean Boundary Commission, well known to all English readers. It resulted in a very fine map that we used all the way down. But the geology and botany

were little known. Not a few people have passed along the mountains, but they have kept outside on the pampa, where travelling is easy. We rode to Norquinco, passed Rio Chubut near Maytén, and proceeded to Lelej, where we had several excursions to make. Here we said good-bye to civilization in the form of post and telegraph, and started on November 3. Through the Nahuelpan pass we came down in the "Valle 16 de octubre," a fertile valley of the subandine type, described by Steffen in this *Journal* some years ago. Here we made an excursion of three days through the forest region to the Chilean frontier.

From here we went right across south, passing close west of Lago Rosario, and came down in the valley of Rio Carrenleufu, generally called "Valle Corcovado." Over large swamps we then found our way eastward to the valley of Rio Tecka, where we stopped several days. The vegetation was now fairly well developed, and gave me a lot of work.

From Tecka river we again set course south and passed the Pico valley, from which we had to cross a 4000-feet-high meseta to come down into the Frias or Cisnes valley, where we stayed a couple of days to explore westward. A road is projected here across to the Pacific. In order to reach the next large depression, where the Aysen river system is laid out, we had to pass outside a very stony meseta and to cross the Senguerr river, one of the largest Patagonian rivers, at the foot of the mountains. We soon crossed the Chilean frontier and halted at Nirehuau, a place belonging to the Aysen Company. We had now left the pampa, and found the country thickly wooded everywhere.

From this place a road is made across to the Coyaike river, and thence along to the main estancia, situated between the high mountains. We stayed a week there in order to give our horses a good rest and to follow the road ourselves down to the Pacific ocean. It is a most interesting road, as it offers a complete section through the mountains and a splendid opportunity to follow the gradual development of the Pumilio-forest into a rich rain-forest. It has been a tremendous work to make this road. For long stretches it is laid with thin sticks, as the ground is extremely swampy; it is impossible to pass at the side of the road, the ground being covered with fallen trunks and overgrown with thick bamboo (*Chusquea quila*). During most of the time we had torrential rain. The distance to the Pacific is 50 miles.

On December 3 we left Aysen. Before us we had a long stretch of uninhabited country, and consequently we had to carry more provisions, making the cargo rather heavy for our two pack-horses. In Tecka we had secured two more animals, making it possible for us to change also the pack-horses, which had proved almost necessary. The provisions were intended to last a month, and I dare say that we only carried the most necessary things, and were prepared to suffer some privations. Rice, some flour, tea, and cocoa were the most important articles, but

our principal food was the meat of guanaco and deer (the huemul), which in this region are rather plentiful. Mostly we had to do without bread —that we regarded as a luxury.

With some difficulty we passed the swampy valley of Rio Mayo, and thus stood at the foot of a 4500-feet-high meseta, which we had to cross, as we knew no pass between it and the main range. It took us three days of hard work. The snow had recently melted—some little brooks could be passed on snow-bridges. The ground looked very firm, being covered with round stones just like an old-fashioned pavement, but the soil underneath was so saturated with moisture that it gave way everywhere under the hoofs of our horses, and we had to wade in the thick clay for hours and hours. The difficulties were highly increased by the sources of Rio Chalia, extended like a fan over the entire plateau and deeply cut down, forming narrow cañadons, filled with an almost impenetrable brushwood. The second day was worse than the first: all the little firm patches of heath were completely undermined by that small rodent, the tuco-tuco, and the descent into the Koslowsky valley, climbing down in the ravines of a very steep 2500-feet-high barranca, was rather adventurous. But down we came, and I got rich remuneration in the flora of the valley. After a day's rest we crossed the valley and sought the next pass over the mountains. Here we could leave the meseta on our left, and had a comfortable march over a 4000-feet-high pass down to the vast depression of Lago Buenos Aires, the greatest Patagonian lake, double the size of Lake Constance. We followed the Rio Fenix, which comes down from the pass, and crossed it near its outlet in the lake. Round this lake, I, for the first time, met with the remarkable and undescribed vegetation mentioned below.

Following the south side of the lake, we crossed the cañadon of Rio Chilcas, and cut across towards Rio do los Antiguos, a large river flowing to the lake. Arrived at the edge of the plateau, we found at our feet a several hundred yards high barranca. Venturing to descend, we slid down in the loose sand till we, to our surprise, found ourselves at the top of an almost vertical, barren sandstone wall, where all further advance seemed impossible. With great risk we climbed down into a crevice, but nearly lost one of our pack-horses, that tumbled down about 100 feet—another inch, and it would have been lost. The cargo was lowered down with ropes, and, cutting steps with a knife in the sandstone, we managed to get the animal over into a ravine, where we could drag it down. We soon crossed the river, and arrived at the parallel river Yeinemeni, which we had to follow south up to the pass. The following days were a constant chain of difficulties. We tried to advance along the river, but every few hundred yards the rushing waters had cut close to the foot of the barranca, and only with the utmost care could we lead the horses across these dangerous passages, where they hardly found any foothold. Now and then they broke out

mad with fright, turned out in the river or climbed the barranca, and had to be fetched back, often with a lot of trouble. At last the road was shut by a vertical wall, and we now climbed about 1000 feet, till we were well above the barrancas, and continued on this height. It certainly was a mistake ever to try the bottom of the valley, but as it came off without disaster, it was only another experience useful enough for the future. At Rio Zeballos, a tributary to Rio Yeinemeni, we made a day's halt to give the horses a rest before crossing the pass and to make an ascent of the mountains to the west of the river. Above 3200 feet the country is thickly wooded. We found the snow-line at about 5500 feet.

The pass gave us some trouble with its "floating soil," where we had to be very careful. The height was about 5000 feet. We followed the Rio Gio down till we found some fuel near the Chilean frontier. Some 2500 feet below us we now had the lakes Pueyrredon and Posadas. The terrain north of them is exceedingly broken and intersected by cracks and cañadons, and along the shore we found the most beautiful traces from the great Ice Age. The two lakes are separated by a narrow isthmus. Lago Posadas lies a yard higher above the sea-level than Lago Pueyrredon, and a short river joins them. Without adventure we passed the river where it flows out in the lake, a high west wind pressing heavy breakers against the current and terrifying the horses, which certainly never had seen anything like it before, and had to be forced out in the foaming swell. Wading across the sand-dunes on the isthmus, we met the mountain range on the south side, where we had to climb from little more than 300 to 3500 feet in a few hours' time. On that height we slowly found our way to the valley of a small river, Rio Tarde, which we thence had to follow up to the next pass. At the last forest patch we halted. New geological formations craved our attention, and the horses badly wanted a rest before crossing the pass. In large snowdrifts and floating soil we crossed at 5800 feet, the greatest height reached with the horses. Between remarkable pillars of basalt we descended into the valley of Rio Belgrano down on to the 2300 to 2500 feet high plateau of Lago Belgrano, where we arrived on December 23. On the way through the cañadon we killed three deer for Christmas—we had been without meat a couple of days, and felt somewhat hungry. A vegetarian has not a very happy time in Patagonia.

We resolved to make a longer stay at the lake. Mr. Halle intended a geological survey to the east, and the rest of us prepared for a boat trip, in order to penetrate as far west as possible. The boundary commission had left a small canvas boat on the south shore of the peninsula. Wind, sun, and rain had treated it rather badly; but still we were able to use it, and set out on the 26th. It was leaking sufficiently to keep one of us occupied. Too much wind and sea

made progress very slow at first, but we waited and set out again. We found Lago Azara situated about 30 feet below Lago Belgrano, that empties through a cascade into the former. We carried boat and luggage the short stretch between the two lakes, and then started again to reach the west arm of the Lago Azara. The entrance is very shallow, and almost shut by innumerable trunks carried out from the forests to the west. We now had reached the forest region. I had expected the forest to change going westward, but only found solitary specimens of the evergreen beech (*Nothofagus betuloides*) on two places. From the end of the west arm we made an ascent of Cerro Aspero up to the glaciers. From this place we had a magnificent view of a very picturesque part of the Cordillera; to the west the undulating, forest-clad hills, with numerous lakes, rising to the high crests and the inland ice; to the north the imposing 12,000-feet-high mount of San Lorenzo, differing in geological structure from the surrounding peaks, of which many reach a height of more than 6200 feet. Returning through Lago Belgrano on the 30th, we passed north of the peninsula. Generally the Andine lakes, as far as known, are deep; but here we found this part of Lago Belgrano so shallow that we hardly were able to pass with our little boat. This is caused by the Rio Lacteo depositing enormous masses of sand or mud.

On January 1, 1909, we continued our march, crossed the rivers Belgrano and Lista, and reached the valley of Rio Ñires in two days. Thence we passed into the valley of Rio Tuco-Tuco, whose name is sufficient to frighten anybody. The entire valley is one extensive and dangerous bog, and the firm margins are completely undermined by the tuco-tuco. We were happy to pass without adventure, cut straight through a dense forest, and slid down the steep barranca of Rio Carbon, where it unites with the Rio Mayer. This river receives the water from the Lakes Nansen, Azara, and Belgrano, makes a sharp turn, and flows to Lago San Martin. We were now separated from that lake by a high pass in the valley between the Meseta and the main range. After a survey round these rivers, we started to ascend the steep and inaccessible cañadon of Rio Carbon towards the pass. As an illustration, I mention that we had to cross the river twenty-seven times before reaching the pass, at a height of, more or less, 5000 feet. It was completely covered by extensive snow- and ice-fields. The last stretch we rode in the river itself between high walls of perpetual snow. On the south side we met with the floating soil, the most treacherous ground one can imagine, sliding down like a thick porridge, and where horses easily get caught as well as people. After a struggle of thirteen hours, during which we had walked perhaps half the stretch, we reached the first bushes and grass in the darkness. A very important geological discovery was made during these days, and Mr. Halle later returned to the place.

Through a narrow cañadon we reached an estancia on the shore of

Lago San Martin on January 7. The owner, Mr. S. Frank, was an old acquaintance, and we had agreed with him to make a boat excursion together in the lake with its curious inlets. Some years ago the last boundary commission had brought a large, fine Berthon boat there. It was left on the beach and never launched. We found it very much in want of repair, and started to work without delay, replaced the broken wooden parts with new, mended the canvas, and painted it all over, and got it tight.

We had to wait several days before we could think of starting. A constant west wind blows for days and weeks, making it impossible to get out of the narrow east arm, which is blocked by the deposits of Rio Fósiles. We went to sleep on the beach the 15th, and started the next day in a fresh head wind. There happened to be sufficient water to let us pass the entrance of the branch, and we steered for the north shore. The party consisted of Quensel, Frank, myself, Pagels and two men from the farm, who had some knowledge of life on water. Bad luck followed us. We kept close under land, looking for shelter behind the protruding points, struggling with a head wind and a heavy sea; but, thanks to the perfect sea-boat, we got out of it without other inconvenience than soaked clothes. Day after day went with rain and storm. The difficulties were increased by the fact that one is always unable to land with a canvas boat on other places than a sheltered sand beach. For long stretches the cliff runs perpendicular into the water.

After eight days' hard work we had entered the western of the two north arms. The vegetation had changed. Round the entrance of the east north arm we came into the forest belt; and, arrived at the first-mentioned branch, we found the mixed forest of evergreen and deciduous-leaved trees. We had a very strong desire to reach the bottom of the branch, where the great lake has its outlet through Rio Pascua to the Pacific, but the scarce provisions and the almost insufferable head wind made us give up this plan when we were about two days' journey from the goal. Instead we turned south and sailed down to the great glacier at the entrance of the south arm, where we had to navigate between icebergs measuring up to 50 feet above the water. We returned south of the Isla Central, and expected to be able to *sail* back—what we really longed for, rather tired of eight days' hard pulling. But now, at last, we got calm weather, and even easterly wind, and thus were forced to continue pulling all the way. The distance covered was 150 miles, and in spite of all bad luck we were satisfied with the results. We arrived at the farm on the 26th, and continued our march two days later. Mr. Halle had been very successful in his stratigraphical and palæontological work during our absence. Going west of Laguna Tar, we reached Rio Shehuen and crossed the Meseta, where we, from a height of only 3000 feet, got a glimpse of both

Lago Viedma and Lago Argentino. In the cañadon of Rio Cangrejo, a tributary to the former lake, we found water, fuel, and grass, the necessary articles for Patagonian travelling. Thence we came down to the sandy and barren shores of Lago Viedma, and followed Rio de la Leona, which carries the water of that lake down to Lago Argentino This part of the Cordillera is the most sterile we have seen. There was no grass for the horses, and we had to watch them closely at night. There were guanaco, and even horse-tracks along the steep barranca, making it possible, but not more, to pass for some miles; but then we climbed up in a ravine, and continued the march at some distance from the river. The landscape, where we now found ourselves, was very remarkable—as far as one could see, only thousands of hills, intersected by deep ravines, not a drop of water or a blade of grass. The ground was full of hidden, funnel-shaped hollows, where only a narrow crack indicated the danger. It reminds one of the "loess" in China, though of course the geological origin has nothing in common with that formation. Close to Lago Argentino we found a small farm, and grass for our hungry animals.

On February 2 we crossed Rio Santa Cruz, and made for the Baguales mountains. Quensel and I had some observations to make in the forest region further west, and we met the other party south of the 4000-feet-high pass at Rio Centinela. In a dry summer like this had been, this pass is good enough; extensive and often impassable swamps cover the ground on the south side. We reached Contreras, and were back to civilization. Thousands and thousands of sheep belonging to the big "Compañía Esplotadora de Tierra del Fuego" graze here, and in the main estancia, called "Cerro Castillo," we got our first correspondence since October. From there Quensel went to Ultima Esperanza (Last Hope inlet), famous for the Gryptotherium cave, and made a boat excursion to the channels west of that place, discovering two new inlets, several miles in length. I myself, accompanied by Pagels, rode in to the farm of Mr. Ferrier, at the foot of Patagonia's most beautiful mountain, the 10,000-feet-high Cerro Payne, where Quensel had made very important geological studies in the previous summer. Wanting to make some phytogeographical observations, we rode farther west through a thickly wooded country, but had to abandon the horses and continue on foot, till we reached the edge of the inland ice and the sources of the river we had followed.

On my way back from Ferrier, I passed Ultima Esperanza and joined Quensel there, and some days later we met Halle, who had occupied himself with some interesting layers with plant fossils in the vicinity of Cerro Contreras; and together we started for Punta Arenas, where we arrived on February 25, looking back upon a distance of 1560 miles, larger excursions included. The straight line from Lago Nahuelhuapi is only 850 miles, more or less.

Phytogeographical Remarks.—It is evident that I had to confine my work to general studies on plant geography and physiognomy. Most of the region had not been visited by any botanist before. I can divide my studies into three parts: (1) Observations on the changes the flora undergoes from north to south; (2) fixing the limits between the different forest zones and between those and the pampa; (3) a more detailed study on the little-known alpine vegetation.

(1) Our way led through the boundary region between forest and steppe, with numerous excursions to both sides. I found the flora of the latter rich in species, but not undergoing very great changes with a different latitude. It seems convenient to establish the following natural formations: the grass steppe; the Mulinum steppe (*M. spinosum*, an Umbellifer); the heath, which has many features of a desert, and as far south as Lago Argentino is characterized by the presence of various Cactaceæ; the brushwood round the rivers, formed mostly by *Nothofagus antarctica;* and the water vegetation. A local but rather remarkable formation is the bush steppe round the great lakes, formed by species of Lythrum, Escallonia, and Verbena, etc. Rich in species at Lago Buenos Aires, it gradually gets poorer, and in the south hardly more than the Escallonias and *Berberis cfr. microphylla*, the most common bush of the pampa, are left. It often was the only fuel available, and a very spiny one indeed.

Concerning the geographical distribution of the pampa plants, the greater part seem to be found all along the Cordillera; in consequence hereof, it is difficult to divide the pampa in latitudinal zones.

I also could follow the longitudinal distribution of the forest. Down to the Corcovado valley we find, to a height of 2400 feet, more or less, patches of *Libocedrus chilensis*, at the very edge of the pampa. All along the mountains stretches a belt of *Nothofagus pumilio*, in the northern part growing from a height of 2500 to 3500 feet and upwards, gradually appearing on a lower level. As we remember, it reaches the sea at the Straits of Magellan. I also had many opportunities to complete my studies of the rain forest.

(2) My conclusions are based upon our excursions across the Cordillera to Lago Nahuelhuapi, in the valleys 16 de Octubre, Frias, and Aysen, and in the lakes Belgrano and San Martín; finally, in the region of Ultima Esperanza. The general rule is that no rain forest is found east of the main range. The low passes and the northern valleys, where rivers cut through to the Pacific, make an exception; here a typical forest of evergreens extends as far as to the east of the Cordillera's highest ridges. After a narrow but often well-marked mixed zone comes a deciduous-leaved wood of *Nothofagus pumilio*, and east of this a margin zone of *N. antarctica*, mostly round the rivers.

I have studied the steppe from 300 feet above sea-level up to the snow limit, which from about 6500 feet in the north of Patagonia

sinks down to about 3800 feet in the south. With exception of the alpine region, which starts at a height of 2500 to 5000 feet, the vegetation is very uniform at different levels above the sea.

(3) Of great interest was the study of the alpine flora and the vertical limits of forest. *N. pumilio* seems to form the alpine dwarf forest everywhere on the east slopes of the Cordillera; on the west side we find *N. antarctica* above the evergreens. The alpine vegetation is rich in species, and contains many remarkable types, and, being little known, the survey ought to give good results. I can mention here that a lot of species, described before from one single place and regarded as very rare, have been found to characterize the whole visited region. The xeromorphic construction of Patagonian alpine plants is very striking. The shape of compact, hard cushions is developed to a very high degree, having representatives in the most different natural orders. Some of these types were probably unknown before.

As a hint to travellers, I will add that I did not carry other plant-press than two pieces of cardboard, and no other paper than the old newspapers I was able to pick up in the farms under way. Still, the collections are quite as big as if I had been working under the most normal conditions.

We did not make any other zoological collections than of insects and spiders.

Geological Remarks.—Mr. P. D. Quensel, B.SC., communicates as follows:—

"Our long ride along the eastern slopes of the Andes gave me a splendid opportunity to study the geological construction of the mountain range, and thereby to complete my earlier researches, partly from Ultima Esperanza and Tierra del Fuego, and partly from the west coast. Naturally on an expedition such as we were now undertaking, and with the small equipment we had at our disposal, it was out of question to make detailed observations everywhere on the route. In most cases I had to be contented with a survey of the principal geological features of the country. We had planned our route along a geological boundary-line, so to say. Most of the way south from Aysen, we passed exactly where the slightly disturbed strata of the mesetas meet the older much-changed sedimentary or volcanic deposits of the Andes. The meseta deposits, which have a vertical extent of between 3000 and 4000 feet, are cut through by the great pre-glacial valleys, which now contain the subandine lakes and the large rivers, which either flow eastward to the Atlantic, and in this case follow the original course of the valley, or westward through the transandine valleys. In the latter case it is without exception glacial deposits which form the water-divide, and have caused the rivers to seek their way through the mountains, at the same time in many instances causing the formation of the large lakes. These same lakes were an obstacle that forced us away from our direct

march-line out on the pampa, but only to return immediately to the contact-line between meseta and the Cordillera, where the erosion has had a favourable point for its attack, and has everywhere formed available passes.

"On our way from Puerto Montt to Nahuelhuapi, I gained a complete section through the Cordillera of these latitudes, and again could state the regular construction of the Patagonian Andes, wherein they so strongly dissemble the more northern parts of the same range. Of interest is the very great proportion of eruptive rocks, which here as well as farther south partake in the formation of the chain; the sedimentary ones are scarce, and mostly to be found on the eastern side. The younger volcanic rocks play the same part as farther south; this question I have already dealt with in an earlier paper.

"From Nahuelhuapi to Aysen, the east Cordillera is almost entirely composed of porphyries and porphyric tuffs of varying appearance and geological age; only in few places the older, highly metamorphosed, underlying sedimentary rocks are visible. At Aysen the above-mentioned road gave another section. Here the eruptives, especially granites, play a still greater part than farther north. For over 40 miles the road traverses one granitic eruptive zone. To the naked eye these granites show no sign of dynamic destruction. One can here classify the Cordillera rather as an eruptive than a dynamic or folded range of mountains. South of Aysen, we come into the region of the mesetas or great plateau-mountains. They are only slightly disturbed, having just been caught in the most recent period of folding, and generally dip only some 10° to 20° to the east. They consist of comparatively loose sandstones and conglomerates, covered by recent alluvial deposits of sand and gravel. The surface is perfectly smooth, except where the rivers, always running west to east, have cut their deep cañadons. South of the lake Buenos Aires, the mesetas are crowned by a cover of basalt and traversed in all directions by volcanic dykes. These eruptions are of recent geological age, and belong to the basaltic eruptions of the pampa formation, dating from Pliocene to post-Glacial age. Farther west these formations discordant overlie the older porphyric tuffs of the central Cordillera, which disappear south of Lake Belgrano. On a boat excursion to the alpine Lake Azara I again found some representatives of the granitic lakkolites I had previously explored in South Patagonia, where they are so characteristic for the eastern Cordillera. A good example is the 12,000-feet-high Mount San Lorenzo, north-west of Lake Belgrano; the highest peaks west of the lakes Viedma and Argentino belong to the same type. Here and there one can still trace the cover of slates as a dark cap on the top of these mountains. South of Lago Belgrano the sedimentary deposits reach farther to the west, and consequently are more disturbed. In Lago San Martin we made another boat excursion to the west, and reached

the great glacier, which reaches the water south-west of Isla Central. All round the lake I had found highly disturbed slates, but the moraine of the glacier only carried andesitic blocks, showing that more to the west the volcanic rocks again play the same important part in the central Cordillera. After my arrival at Ultima Esperanza, I finally made another boat excursion in order to complete my observations of an earlier date in those parts."

Mr. T. G. Halle, B.SC., gives the following communication of his researches:—

"During the journey from Bariloche to Punta Arenas, we had good opportunity to study the geology of the transitional zone between the Cordillera and the Pampa. The older rocks which here appear at the surface are comparatively little known, and subsequently formed the most interesting object for our researches. Much time was also spent in studying the plant-bearing layers, fossil plants having been described hitherto only from a few places south of Lago Argentino.

"In the great Tertiary tuff and sandstone formation, which extends over a large area south from Lago Nahuelhuapi, fossil plants were found in several localities. Near Bariloche the impressions occur in great folded beds of a grey tuff. Consequently the formation of the mountain range was not yet finished at the time when the tuff-beds were deposited. Other localities for fossil plants are Cerro Colorado, about one day's ride south from Bariloche, and Estancia Lelej, some days further south. Many of the specimens are well preserved, and will make it possible to determinate the age of the formation, and also of the last upraising of the Cordillera in this region.

"At Rio Aysen, where we had opportunity to make an excursion through the Cordillera and down to the Pacific coast, the structure of the mountain range is quite different. Even close to the eruptive zone the range is built up of slates, sandstone, and tuff, lying in horizontal beds and not showing any signs of folding or regional metamorphosis. In some places the slates contain fossils, by the presence of ammonites and belemnites proving not to be younger than Cretaceous, and consequently older than the raising of the mountain range as known further north or south.

"South from Rio Aysen we crossed the high mesetas round the upper parts of the rivers Chalia and Guenguel. These mesetas were found to consist of light-coloured and very soft sandstones and tuffs. Also here fossil plants were found, which by comparison with those from the tuff series further north will give some information on the relation between these two formations. South of Lago Buenos Aires, in the region explored by Hatcher, collections of fossils were made at several localities.

"The geology of the large meseta north of Lago San Martin proved to be of great interest. Especially the older layers are here very well displayed in the valleys of the rivers Carbón and Fósiles. The undermost

layers in the meseta consist of dark folded slates containing a comparatively rich marine fauna. This series probably is identical with the 'Mayer River-beds' of Hatcher, which were referred by that same author to the Upper Jurassic, though the determination remained somewhat doubtful, the fossils being scarce and badly preserved. The black slates are covered by mighty beds of a yellow sandstone, which to the west also are folded and dislocated, but further east appear undisturbed, only dipping slightly to the east.

"In the bottom of the sandstone series I found in one place a fossil flora, consisting of a cycad, a *Baiera*, and several conifera and ferns, but no dicotyledons. This flora is of great interest, as nothing of the kind is known before from Patagonia.

"In the region south from Lago Argentino, where R. Hauthal has made detailed studies of the geology during a long time, my attention was confined more especially to the plant-bearing layers, and collections were made in several places."

VII. The Region of the Beagle Channel.

The last link in our chain of excursions was to be a visit to the Beagle channel and its neighbourhood. This region has been visited plenty of times by scientific expeditions since the discovery by H.M.S. *Beagle;* but in spite of this fact, our researches in the *Antarctic* gave good results, and when that vessel left Tekenika bay in November, 1902, it carried a precious load of various materials. These, however, were all lost with the ship, and the intentions of our little enterprise were principally to secure new collections and also to solve some questions aroused by the first-mentioned expedition.

With orders from the Chilean Government, which never failed to render us the most valuable assistance, the new chief of the naval station in Punta Arenas, Rear-Admiral F. Valenzuela, put a small steamer, the *Porvenir*, at our disposal, and we left that place on March 7. At nightfall we anchored in Puerto Barrow, and the next day steamed through the Brecknock passage, entering the western extremity of the Beagle channel, when our first station was Puerto Fortuna. After having visited the unknown Ventisqueros sound, Bahia Romanche, and the Darwin glacier, we anchored in Lapataia on the 7th. From here Mr. Quensel and I pulled up the river, and thence along the Lake Acigami to its north-west end, from where we made an excursion on foot in order to ascertain that the river whose sources we discovered in March, 1908, south of Sierra Valdivieso, and named Rio Rojas, is the same that empties in the lake. Thus here is a pass from Lake Cami to the Beagle channel. Later, I got to know that the Indians who lived here before probably used this pass to come from Almirantazgo down to the channel.

We left on the 9th, and passed the Murray Narrows between the islands Navarin and Hoste, visited the small mission station in Douglas

bay, where the last remnants of the Yaghan tribe are collected under the superintendence of Mr. Williams, who moved his place from Tekenika two years ago, and anchored in Allen Gardiner bay. Here Mr. Halle went ashore and stayed for some days. The *Porvenir* went to Orange bay, where the great French expedition had its headquarters in 1882–83. The commemorative pyramid was found to be intact still. On the 12th we visited the Wollaston islands, and returned at night to Packsaddle bay, where also Packsaddle island was visited.

In Tekenika we picked up Halle, and went straight to Ushuaia, where we stayed one and a half days for botanical excursions. From there we went to Gable island for geological investigations, and finally to Harberton and Slogget bay. Paying a second visit to Harberton, we arrived at Ushuaia the 18th, leaving the following morning.

On our return voyage we visited Puerto Edwards, and landed in Puerto Arenas on March 21.

In our original plan we had prepared for a longer stay in the Beagle channel, especially for anthropometrical work amongst the Ona Indians. But already, when we came to Buenos Aires in October, 1907, we learnt that the well-known ethnographer, Prof. Lehmann-Nietsche, of La Plata, was working with the same subject, and in Harberton Mr. W. Bridges informed me that an American had visited him and obtained his valuable observations on the life of those Indians. In consequence, we resolved to give up this part of our programme.

The expedition returned to Buenos Aires March 31, and left for Sweden on May 23.

A SIXTEENTH-CENTURY MAP OF THE BRITISH ISLES.

The first number of the current volume of *Globus* (vol. 92) contains the reproduction, with short description by Mr. W. Reinhard, of an early manuscript map of the British Isles, now in the British Museum, which does not appear to have met with much notice on the part of writers on British topography. The original, which is clearly drawn on vellum and coloured, measures 2 feet 1 inch by 1 foot 6 inches. We are informed that it was acquired by Sir Robert Cotton early in the seventeenth century, and came to the museum in George the Third's time.* In the catalogue of manuscript maps in the British Museum it is assigned to the time of Queen Elizabeth, though Mr. Reinhard is inclined to place it somewhat earlier. The grounds for this opinion do not seem entirely satisfactory, the principal being the inferior accuracy of the outlines of Scotland as compared with those in the map by George Lily (1546), frequently reprinted in Italy during the course of the sixteenth century, and stated by Gough to have been "the first exact map of this island." Should his view, however, be correct, the map will possess the

* It would thus seem to have not been included in the Cotton Library as originally placed in the museum in 1753. This may explain the fact that it is not mentioned by Gough in his essay on British maps in the second edition of his 'British Topography' (1780), though other maps in the Cotton Library are referred to.

interest of being the earliest in which the outlines of Scotland are shown with an approximation to the truth; this result being possibly due, as Mr. Reinhard suggests, to the circumnavigation of Scotland by King James V. in 1540.

The map shows other differences from Lily's map (or, at least, from the later versions of it), though there is some general resemblance. Ireland, in particular, is shown as running almost due north and south (as in Nowell's map of the same century reproduced by the Ordnance Survey), instead of being inclined to the meridian as it really is, and as Lily drew it. As regards England, there is little, if any, inferiority, and the amount of detail shown is at first sight remarkable, as is the general accuracy of the information. Besides the chief towns, many of the more important villages are marked, including some which have remained little more than villages to the present day. We still find Orwell (placed, however, south of the river on which Ipswich is marked, while Harwich is also misplaced to the north), and Dunwich, though there is no trace of Ravenspur in Yorkshire. Just north of the Humber is Sisterkirk, representing the two villages of Withernsea and Owthorne, the latter of which has now disappeared. Among minor points of detail, we find the isles of Axholme in Lincolnshire and Oxney in Kent (both shown as entirely surrounded by rivers). Bromholme, which figures prominently on the Norfolk coast, represents Broomholm Priory, to be looked for in vain on a modern general map of England. Many of the small islands round the coast are marked, including several which are, now at least, almost or quite joined to the mainland (Thanet, Sheppey, Mersea, Foulness, etc.).

In regard to the English section, however, it must be remembered that long before the sixteenth century fairly detailed maps of that kingdom were in existence, as is shown by the manuscript map once in the possession of Gough, and now preserved with his papers in the Bodleian at Oxford, which is supposed to date from about 1300. Mr. Reinhard mentions this, but makes no attempt at a comparison. In several points the Cotton map shows traces of the influence of the earlier map or of intermediate examples now lost, as, *e.g.*, in the general shape of Wales and in the position of the islands round its coasts. A majority, perhaps, of the names and features are common to both, though the later map contains a good many additions and variations. Thus, though both Portland and Selsea are marked as islands in both maps, in the Cotton map the former bears the name Corfe.* The most curious point of connection between the two maps is as follows: A row of five islands shown in the Cotton map off the coast of Lancashire and Cumberland is at first sight a puzzle, but the explanation is supplied by the earlier map, where the names of the rivers of this part of England appear, in small squares, off their respective mouths. The squares have evidently been mistaken by a copyist for islands, and accordingly in the Cotton map we find that the names given to the islands are in reality (in somewhat corrupted form) those of the rivers Lune, Kent, Leven, Duddon, and Esk.

Scotland, Wales, and Ireland are naturally shown more roughly than England, and, as Mr. Reinhard says, the data for these may have been taken from the writings of Boethius, Polydor Virgil, and Giraldus Cambrensis. As an example of a name due to the second of these, he quotes the forms employed for Argyll—Argatelia or Argadia—though as these occur in other literature of the time (*e.g.* in the list of place-names ascribed to the above-mentioned George Lily, in Paulus Jovius' Description of Britain), this alone would not prove a direct borrowing from Polydor Virgil. In Wales (Wallis) Snowdon is prominently marked (as "Snowdone hillis"), and in Scotland the Grampian range is equally in evidence.

* In Mercator's map of 1564 Corfe is also shown as an island, but in its proper place, while Portland appears in addition.

The map may be placed with that of Lily as an example of the greatest advance in the mapping of Great Britain before the middle of the sixteenth century,* though falling short of the maps printed by Mercator and Ortelius, one or two decades later, from originals sent over from England (by Humphrey Lhwyd, in the case of the Ortelius map). The more detailed maps of Saxton belong, of course, to a new epoch.

THE SURVEY AND MAPPING OF NEW AREAS.†

By Colonel Sir DUNCAN JOHNSTON, K.C.M.G., C.B., R.E., F.R.G.S., F.G.S.

After referring to the principal geographical achievements of the past years, Sir Duncan Johnston proceeded to say—

The best modern explorers are not now content with exploration or even with a rough route traverse and an occasional observation for latitude; they either themselves make careful reconnaissance surveys of the country adjoining their route or they are accompanied by trained surveyors, who make such surveys. Again, every year the area surveyed on correct scientific principles is extended. The interesting address of my predecessor, Major Hills, will have told you what is being done in this way in the British Crown colonies. In the British self-governing colonies and in the colonies and dependencies of other powers the area of regular survey is being continually extended, and in more remote regions surveys are being carried out by Boundary Commissions or for railways or other purposes. Along with the increasing appreciation of the value of geography which has taken place of late years, there has been an increasing recognition of the need for regular surveys, and it is probable that the next generation will find that not only is no considerable area of the Earth's surface unexplored, but that the area not yet surveyed at least geographically, or for which a regular survey has not been projected, is getting limited.

I propose in the rest of my address to deal with the regular survey and mapping of new areas, and to discuss various questions connected therewith; if I am right in believing that large areas will be regularly surveyed in the near future, such questions merit careful consideration. I shall state on these points the practice of some of the great national surveys, because their experience seems the best guide for future work; but I recognize that methods suitable for rich and populous countries, such as Germany, France, or Great Britain, may be too costly for many countries and provinces whose survey has still to be made, and mention will be made of less expensive methods which are likely to be much in demand in future.

It would be difficult to say anything new on the subject I propose to deal with, and I lay no claim to do so, still less do I wish to dogmatize as to the best methods. When I express opinions I shall also state the practice of some of the principal surveys of the world, and my hearers, having weighed the matter, can accept my opinions or not according to their judgment. In either case my object will have been attained if careful consideration is given to the points raised.

Maps may be roughly divided into three classes:—

(1) Geographical maps—*i.e.* those on very small scales.

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* Another map which bears traces of the use of common material is that of Sebastian Münster, inserted both in the Basel Ptolemys of 1540 and later years, and in his 'Cosmography,' though this is a far rougher production.

† Presidential Address to the Geographical Section of the British Association, Winnipeg, August, 1909.

(2) Topographical maps. The dividing line between these and geographical maps is not very clearly defined. For the purpose of this address maps between the scales of 4 miles to the inch and $\frac{1}{25000}$ scale will be considered as topographical.

(3) Cadastral maps—*i.e.* maps on large scales mainly for property purposes.

As the time at my disposal will not admit of my discussing all three classes of maps, and as I have on a previous occasion read a paper to this Association on 'Cadastral Surveying,' I propose to limit my remarks to topographical surveys and maps.

In most of the older countries topographical surveys have originally been made to meet military needs, and as a rule they are carried out under military supervision. In order that they may be useful in case of war such surveys must have been made before war breaks out. The use, however, of topographical maps is not limited to military purposes; on the contrary, they have invariably proved of great value for civil requirements. In one respect they are more useful for civil than military purposes, as a state of war occurs rarely, and hence while the maps are only occasionally used in connection with war, they are constantly used in connection with civil administration and with public and private business of all kinds. The topographical maps of the Ordnance Survey, prepared originally solely for military requirements, have proved extremely useful for civil purposes. Directly or indirectly, all the numerous maps prepared by the trade in Great Britain for civil use are based on them. I believe the experience of all other countries is similar to that of the Ordnance Survey. In most countries in which land is of any value, a cadastral survey for land transfer purposes is needed, as well as a topographical survey. In some cases, indeed, the need for a property survey has first made itself felt; thus in the Transvaal and in the Cape Colony, neither of which yet has a topographical survey, there has for many years been a Government Survey Department for making property surveys. The question arises whether there should be two separate surveys, one for topographical and one for cadastral maps, or whether there should be only one survey, the topographical maps being prepared by reducing the cadastral survey. Incidentally the further question arises whether, if two separate surveys are made, they should be under one head.

In most countries—the Ordnance Survey of the United Kingdom being an exception—not only are entirely separate surveys made for these two classes of maps, but these surveys are generally under different departments. In some cases the cadastral surveys are isolated farm surveys, showing little detail except property boundaries. Such surveys would, of course, not answer as a basis for topographical maps. In other cases, however, the cadastral surveys show all necessary detail except ground forms, which can be added by a separate survey. The only cadastral survey, so far as I know, which shows ground forms is the Ordnance Survey, whose 6-inch maps are contoured.

A difficulty in the way of utilizing the cadastral survey for the smaller-scale maps arises from the fact that a cadastral survey is, from its large size, much slower than a topographical survey. It is often found advisable to take up the survey of the former somewhat irregularly, while it is important for the proper progress of the latter that it should be taken up regularly and methodically. The Ordnance Survey 1-inch map has, since 1824, not had a separate survey of its own, but has been based on the cadastral survey. Ordnance Survey experience has shown that the delays in completing the topographical map, due to this course, have been much greater than one would have expected, and that there are grave disadvantages in having the scale of survey very much larger than that of the finished map. These objections do not apply, or can be overcome, if the cadastral survey of any locality is completed before the topographical map is taken up. This is a condition not likely to

be often fulfilled in the case of future topographical surveys. I advocate therefore that, following the general practice, there should be entirely separate topographical and cadastral surveys. I should advocate this even where it is essential to keep the expense as low as possible. More economy would probably result from the adoption of a fairly small scale for the topographical map, from curtailing the small detail to be shown on it, and from showing on the cadastral maps only such detail as is needed for property purposes, than would result from making one survey do for both classes of maps.

On the other hand, I consider that, even when separate surveys are made for the two classes of maps, it is advantageous that both should be made under the same head. The more usual course is, however, to have the two surveys independent, and in some cases local circumstances may make the course I advocate inadvisable.

Triangulation.—The first preliminary to any survey should be a triangulation. It is the most satisfactory course, and the best economy in the long run, to carry out with the greatest accuracy possible the primary triangulation on which the survey is based. Such a triangulation will remain good for a very long period. For example, the primary triangulation of the Ordnance Survey was commenced in 1791; while some doubts have been expressed whether it is accurate enough to combine with other more recent work for the purpose of investigating the figure of the Earth, no one has questioned that even the earliest part of this triangulation is amply accurate enough for map-making purposes.

On the other hand, I do not advocate carrying out a primary triangulation until arrangements have been made for basing a survey on it. In South Africa an excellent and very accurate primary triangulation has been carried out. This triangulation was undertaken largely, no doubt, for scientific purposes. While answering its purpose in that respect, it has so far had no surveys of any great extent based on it. An accurate triangulation is now a much quicker and less expensive operation than it used to be. The introduction of Invar tapes and wires has largely expedited and simplified the accurate measurement of base lines, while the improvements effected in theodolites enable equal or greater accuracy to be obtained with the comparatively small and handy instruments now made than could be got formerly with large and cumbrous instruments, such as the 36-inch theodolites, with which most of the primary triangulation of Great Britain and Ireland was carried out. Unless observations are rendered difficult by numerous buildings, by trees, or by a hazy or smoky atmosphere, a good primary triangulation should not now be very expensive. It is usual to base on the primary triangulation a minor triangulation of several orders, the object being to have an accurate framework of trigonometrical points on which to base the survey. If it is important to keep the expense low, the trigonometrical points may be rather far apart, intermediate points being fixed by plane-table; but it should be remembered that it is the truest economy to make the best triangulation which funds admit of. In forests or in wooded and rather flat country, where triangulation would be very expensive, lines of traverse made with every possible accuracy, and starting and closing on trigonometrical points, may be used instead of minor triangulation.

Detail Survey.—Provided the detail survey is based on triangulation, it may be made by any recognized method. Plane-tabling is now almost universally resorted to, and is probably as cheap and convenient as any other method. The vertical heights of the trigonometrical points will have been fixed by vertical angles with reference to some datum. The height of intermediate points can be fixed by clinometer lines, especially down spurs and valleys, and even by aneroid, and from these heights the contour-lines can be sketched in. Altitudes can be more accurately fixed by spirit-levelling, but this is an expensive method not likely to be much used

in the case of topographical surveys. It is possible that in exceptional cases photographic surveying may be resorted to with advantage, and undoubtedly photographic methods sometimes enable work to be done which would not otherwise be feasible. The photographic method suggested by Captain F. V. Thompson, R.E., is an advance on previous methods. In Canada, I understand that a good deal of photographic surveying has been done, and presumably the conditions in Canada have been found suitable for this method. It has been little used elsewhere.

Scale of Map.—The next point for consideration is the scale on which the map is to be published, and it is an important one. Speaking generally, the cost increases with the scale, and cost is therefore one of the main determining considerations. The physical and artificial character of the country, the amount of detail it may be decided to show on the map, the method adopted for representing hills and other detail, and the method of reproduction to be used, all affect the question. Clearness and legibility are among the first essentials of a good map, and it is desirable that the scale should be such that all detail it may be decided to show on the map can be inserted without overcrowding; or conversely, if the scale is fixed, the amount of detail and method of showing it should be such as to avoid the common fault of overcrowding the map. In populous countries such as Belgium, France, and Germany, where buildings, roads, railways, &c., are numerous, a larger scale is, *cæteris paribus*, desirable, than in less populous countries. All important detail, such as roads, railways, canals, forests, woods, &c., should appear on the map, as should the more important names, but it is a matter for consideration how far minor detail, such as orchards, marshes, rough pasture, state of cultivation, etc., should be inserted on the map, and to what extent the less important names should be omitted. In hilly country hachures and contours, especially if in black, tend to obscure the detail and names, and the smaller the scale the greater this tendency.

Methods of reproduction will be dealt with later, but I may here say that more detail and names can be shown clearly on a given scale if the map is engraved on copper than if reproduced in any other way. The scales adopted by different countries vary very much—I give below the scales adopted by some of the principal surveys.

$\frac{1}{25000}$ scale—Switzerland (the more populous parts), Prussia, Baden, Saxony, Bavaria, and Würtemberg (these German maps, although called maps of position, are practically topographical).

$\frac{1}{40000}$ scale—Belgium and Denmark.

$\frac{1}{50000}$ scale—France (the new topographical map), Algeria, Tunis, Holland, Japan, Spain, Switzerland (the less populous parts).

$\frac{1}{62500}$ scale—the United States (the more populous parts).

$\frac{1}{63360}$ scale (1 inch to a mile)—Great Britain and Ireland, and Canada.

$\frac{1}{75000}$ scale—the Austrian Empire.

$\frac{1}{80000}$ scale—the old staff map of France.

$\frac{1}{100000}$ scale—the German Empire, Italy, Norway, Portugal, Sweden, and Switzerland (Dufour atlas).

$\frac{1}{125000}$ scale—the United States (the less populous parts).

$\frac{1}{126000}$ scale—Russia.

$\frac{1}{250000}$ scale—the United States (barren districts).

The introduction of cycles, motors, and other rapid means of locomotion has led to a demand for a scale which will show a considerable tract of country on a sheet of moderate size. If the standard map is already on rather a large scale, this demand is best met by publishing a reduction of the standard map. This course is followed by Great Britain and Ireland and by Canada, whose 1-inch map is reduced to and published on the $\frac{1}{2}$-inch scale; but if only one scale is used a

compromise must be arrived at which will meet the reasonable requirements of rapid locomotion, as well as the other essentials of a topographical map.

If I may venture an opinion in a matter in which practice varies so much, it is that for countries using British measures in which, owing to dense population, the detail is close, the 1-inch scale ($\frac{1}{63360}$) is a very good one, and that for more open parts the $\frac{1}{2}$-inch scale may with advantage be adopted. For countries using metrical measures, I should advocate $\frac{1}{62500}$ and $\frac{1}{125000}$ respectively. These scales do not differ largely from those adopted by most of the principal countries, the majority of whom use scales between $\frac{1}{50000}$ and $\frac{1}{100000}$ for fairly close countries. Where it is important to keep the cost down, I should advocate a half-inch to the mile or a $\frac{1}{125000}$ scale. All except the most closely populated country can be shown clearly on such scales, provided the maps do not show too many names or too much small detail. The United States have scales of $\frac{1}{62500}$, $\frac{1}{125000}$, and $\frac{1}{250000}$, the general closeness of detail in any area determining which of these three scales is adopted. This arrangement is a good one, and would be still better if the areas published on the $\frac{1}{62500}$ scale were also reduced to and published on the $\frac{1}{125000}$ scale, and if the whole country were published on the $\frac{1}{250000}$ scale. The principle here advocated of having each scale as far as possible complete for the whole country has been carried out by Great Britain, where the whole country, except some uncultivated areas, is published on the 25-inch ($\frac{1}{2500}$) scale, and the whole country on the 6-inch, the 1-inch, the $\frac{1}{2}$-inch, the $\frac{1}{4}$-inch, and other smaller scales.

Scale of Field Survey.—It is usual to make the field survey for small-scale maps on a larger scale than that on which the map is to be published with a view to securing greater accuracy of detail, but this should not be overdone. If the field survey is on too large a scale it entails needless expense, also when the surveyor is working on too large a scale he is apt not to realize the effect of reduction on his survey, and is likely to survey so much detail as to overcrowd the map, thus increasing the cost of the work and injuring the map. When the map is reproduced by photographic methods the fair drawing is usually on a larger scale than the finished map, so as to get finer results on reduction; but in this case also, for somewhat similar reasons to those stated above, there are limits to the amount of reduction which can be made with advantage. In these respects the practice of different countries varies considerably. In Austria the field survey is on the $\frac{1}{25000}$ scale; this is reduced to and drawn on the $\frac{1}{50000}$ scale, and this drawing is reproduced by heliogravure on the $\frac{1}{75000}$ scale. In France the field survey is on the $\frac{1}{10000}$ or $\frac{1}{20000}$ scale. The survey is reduced to and drawn on the $\frac{1}{40000}$ scale. In Algeria and Tunis, both field survey and drawing are the $\frac{1}{40000}$ scale. In all cases the French maps are now reproduced by heliogravure on the $\frac{1}{50000}$ scale from the $\frac{1}{40000}$ drawings. In Germany the field survey is on the $\frac{1}{25000}$ scale. This is reduced to the $\frac{1}{100000}$, on which scale the maps are engraved on copper. In Great Britain the 1-inch map is based on the 25-inch and 6-inch survey. These were reduced, and a fair drawing was made on the 2-inch scale in a manner suitable for reduction to the 1-inch scale—*i.e.* the detail, lettering, etc., were drawn so that when reduced to the 1-inch scale they should be in proper proportion. This drawing was reduced and printed by heliozincography on the 1-inch scale, and from these prints was engraved on copper. In America the field surveys are on the scales of $\frac{1}{48000}$, $\frac{1}{96000}$, and $\frac{1}{19200}$ for the $\frac{1}{62500}$, the $\frac{1}{125000}$, and the $\frac{1}{250000}$ scale maps respectively. The drawings, on the same scale as the field survey, are reduced by photography and engraved on copper.

I consider that the best results are obtained when the field survey is made on double the scale of the finished map; that if reproduction is to be by engraving,

the fair drawing should be on the same scale as the finished map; that if, on the other hand, reproduction is to be by photographic methods, the fair drawing should be on the same scale as the survey, *i.e.* double that of the finished map. The reduction I advocate should conduce to accuracy of detail, and, if reproduced photographically, to fineness of detail, while it is not so great that the surveyor and draughtsman should be unable to realize the effect of reduction.

Detail.—The need of considering the amount of detail, etc., to be shown is not always sufficiently realized. The way in which detail is to be represented also needs consideration, as on small-scale maps much detail has to be represented conventionally. Railways have to be shown conventionally, and should be so marked that they catch the eye without being too heavy. Roads also should be clearly marked. Where different classes of roads exist they should be distinctively shown, main roads being more prominent than others. It is important to know what roads are fit for fast wheeled traffic in all weathers, and which are fit only for slow traffic. The exact classification of roads must depend on the conditions obtaining in the country. The most elaborate classification is that shown on the French maps, and next that shown on the maps of Great Britain. Provided that important distinctions are represented, the simpler the classification the better. Forests, woods, marshes, and in some cases pasture, rough pasture, orchards, vineyards, gardens, etc., are shown by conventional signs. While forests, woods, and marshes should certainly be distinguished on the maps, I incline to the opinion that the state of cultivation is better omitted, and that the less small detail shown the better. Such small detail increases the cost and often overcrowds the map. The German $\frac{1}{100000}$ scale shows much small detail, and although the maps are beautifully and delicately engraved on copper, the detail is rather crowded on some sheets. The French Carte Vicinale is, in my opinion, rather crowded with names.

The most difficult question, and that on which opinions differ most, is the method of representing ground forms. Methods which answer well on steep ground are less satisfactory on gentle slopes, and *vice versâ*, and each method is open to some objection. Ground forms may be indicated by contours; hill-shading in stipple, vertical hachures, horizontal hachures, the layer system, or by a combination of some of these. Ground forms are represented by contours on the $\frac{1}{25000}$-scale maps of the German States, the Swiss Siegfried Atlas, the maps of the United States, the 1-inch map of Canada, the $\frac{1}{40000}$-scale map of Denmark, and the maps of Japan. Where the slopes are steep the contours give almost the effect of hill-shading. Some of these maps give a very good representation of the ground, the best being those in which the contours are in colour. Hill features are shown by stipple shading on the French Carte Vicinale and the Ordnance Survey 4-mile map. In mountainous country stipple shading gives a good pictorial representation of the ground, but it fails in flatter country, and it is often difficult to tell from it which way slopes run. The Swiss Dufour Atlas ($\frac{1}{100000}$ scale) is a good example of vertical hachuring, as are some of the German $\frac{1}{100000}$-scale maps. Vertical hachures are also used on the Austrian and Swedish maps, and in conjunction with contours on the maps of several other countries. Vertical hachures, when well executed, give an artistic and graphic representation of the hills. In the Swiss and British maps the pictorial effect is enhanced by assuming a light from the left-hand top corner. In steep ground, especially when the hachures are in black, these are apt to obscure detail and names. I think hachures are better when printed in colour, but many will disagree with me on this point. Horizontal hachuring, while having some advantages, is less effective and is little used.

The system generally known as the layer system has been used in Great Britain by the well-known Scotch firm of J. Bartholomew & Co., has recently been

adopted by the Ordnance Survey for its ½-inch maps, and is used in the ½-inch maps of Canada. It consists in indicating by various shades of colour the area lying between certain contours; thus one shade may be given to all ground below the 50-feet contour, another shade to ground between the 50 and 100 feet contour, and so on. This system gives a general indication of ground form, and enables the contour-lines to be followed more easily. Its shades of colour enable the eye to pick out more easily all land lying at about the same level. It is most effective in ground with a small range of vertical height, as the vertical depth of layers can then be small and the distinction in colour between successive layers marked. In hilly ground the depth of the layer must be increased, which means that many ground features are ignored on the map, or the number of layers on the map must be large, in which case the distinction in shade between successive layers will be less marked. This method is popular in Great Britain, and enables those who are not versed in reading contours and hachures to realize something of the nature of the ground forms.

A combination of these methods has been used as follows: France on her $\frac{1}{500000}$-scale maps shows ground forms by contour-lines and stipple shading. This gives a very fair representation of the ground, but where the contours are very close together the effect of the coloured contours on the stipple is not pleasant. Nor does the stipple always look well when it falls on colour. The German coloured $\frac{1}{1000000}$-scale map, the Italian $\frac{1}{1000000}$, and the British 1-inch show both contours and vertical hachures. The Norwegian $\frac{1}{1000000}$-scale map shows the features by contours, vertical hachures, and shading. The new British ½-inch scale map has both contours, layers, and stipple shading.

Opinions differ so much on this subject, and there is so much to be said for and against each method, that I will confine myself to the opinion that contours reasonably close together should form the principal feature of any method of representing ground forms; that contours by themselves give a very fair representation of the ground; that vertical hachures, if printed so as not to obscure the detail and names, or stipple shading when there is not too much colour on the maps, increase the pictorial effect and are useful additions to contours; that ground forms should preferably be in colour; and that where hachures or stipple are used as well as contours, both should be in the same colour. The German coloured $\frac{1}{1000000}$-scale map (brown hachures and contours), the British 1-inch scale copper-plate printed map (brown hachures and black contours), the British 1-inch coloured map (brown hachures and red contours), and the French $\frac{1}{500000}$-scale (grey stipple and brown contours), all give a good representation of the ground, and there are other maps which might be named almost, if not quite, as good.

Vertical Interval of Contours.—The vertical interval between contours should depend partly on the scale, partly on the steepness of the ground. Practice varies considerably in this matter. The $\frac{1}{250000}$-scale maps of Switzerland and of Germany, except Prussia, are contoured at 10-metre intervals. The $\frac{1}{500000}$-scale maps of France are contoured at 10-metre intervals. The $\frac{1}{500000}$-scale maps of Japan and Spain are contoured at 20-metre intervals. On the Swiss $\frac{1}{500000}$ scale contours are 30 metres apart. On the United States $\frac{1}{632500}$ scale the contour interval varies from 20 to 100 feet. On the British 1-inch map there are contours at 50 feet, at every 100 feet up to 1000 feet, and thence at 250-feet intervals. On the Canadian 1-inch and ½-inch maps the contour interval is only 25 feet, but the sheets published have been in ground with only moderate elevations. On the German $\frac{1}{1000000}$ scale the contour interval is 50 metres.

I consider that if the contours are printed in colour the vertical interval may with advantage be such that on steep ground the contours are reasonably close together, every fourth or fifth contour being printed heavier so as to be more easily

followed. If the contours are in black they cannot with advantage be so close. It is, in my opinion, best if the contour interval is uniform all over a country. Failing this, it seems desirable that it should be uniform over considerable areas, and at least throughout a sheet; but this view is not universally held. I do not like the varying interval adopted by the Ordnance Survey. The contours on the Ordnance Survey maps are surveyed with great accuracy and at great expense. For topographical maps much cheaper and more rapid methods will suffice.

Cartography.— I have, with a view to clearness, kept the question of the method of reproduction separate, but it has a bearing on some of the points already considered. Thus the fine engraving of the German $\frac{1}{100000}$-scale map enables an amount of small detail and ornament to be shown on that map which could not have been clearly shown if any other method of reproduction had been used. The older maps were generally engraved on copper, or sometimes on stone, and printed in black and white. Subsequently photographic methods, such as the photogravure of the Austrian and the more recent $\frac{1}{50000}$-scale French maps, were used, and colour printing is now largely resorted to. In some cases the colour plates are prepared by engraving on copper, stone, or zinc. The maps of the United States and Switzerland are engraved on copper. In other cases—for instance, the 1-inch Ordnance Survey—colour-plates are prepared on stone by transfers and offsets from the engraved copper plate. In other cases—*e.g.* the $\frac{1}{50000}$-scale map of France—the colour-plates are prepared by photographic methods. For clearness, delicacy of outline, and artistic effect nothing equals engraving on copper. It forms also the best basis for colour-printing. Unfortunately, it is very slow and costly. Engraving on stone is quicker and less expensive than copper engraving. It is inferior in delicacy to the latter, but some of the best stone engraving is very good. Photographic methods are the most rapid and the cheapest, and with care give very fair results. As good examples I may quote the $\frac{1}{75000}$-scale maps of Austria, prepared by heliogravure, and the 6-inch maps of the Ordnance Survey, prepared by heliozincography, both black and white maps. Of colour-printed maps I may instance the new $\frac{1}{50000}$-scale map of France prepared by heliogravure, and the $\frac{1}{2}$-inch Ordnance Survey map hitherto prepared by photo-etching, although I understand that in future the outline will be engraved on copper. When rapid reproduction and moderate cost are desired, I do not hesitate to recommend photographic methods, which, although not so good as engraving, give, when carefully executed, reasonably good results.

Opinions differ as to the extent to which colour should be used, the modern tendency being to use it very freely. I can hardly be accused of prejudice against colour, as during my tenure of office at the Ordnance Survey colour-printing was largely developed, but I think it is often overdone. I consider that a moderate amount of colour is a great improvement to a map. Ground forms, however indicated, can, in my opinion, be better shown by colour than by black; it is advantageous also to distinguish water by colour, to give prominence to main roads by colouring them, and to colour woods and forests, but I do not advocate going much beyond this. It is difficult to choose colours which are suitable, distinctive, and harmonious, and the more numerous the colours used the greater the difficulty of doing so.

Colour-printing introduces possible sources of error. Colour maps are based on a drawing on which all detail to appear on the map is shown. A plate is prepared for each colour on which there should be only such detail as shall be printed in its particular colour. In preparing this plate there is a risk that detail which should appear may be omitted, or that detail be inserted which should be on another plate, or that the detail may be slightly out of position. Again, owing to change of temperature and to the varying amount of moisture in the air, paper contracts or expands. Registration can rarely be mathematically correct, and with every care

may sometimes be appreciably out. While with care errors such as I have indicated can be minimized so as not appreciably to affect the map, it is difficult to ensure that they should be altogether absent.

To recapitulate my views, I advocate for a topographical map a scale between $\frac{1}{62500}$ and $\frac{1}{126720}$ ($\frac{1}{2}$ inch to a mile), according to circumstances. The scale of survey to be double that of the finished map; ground forms to be shown by contours reasonably close together, the exact interval depending on the scale of the map and the nature of the country, also, if funds are available, by vertical hachures; both contours and hachures, if shown, to be in colour, the same colour being used for both. If considerations of time and cost do not admit of reproduction by engraving on copper, the map to be reproduced by some photographic method and printed in not more than five colours. I put forward these opinions rather as a basis for consideration than as having special weight in themselves. With the increasing recognition of the importance of geography an increasing demand for maps is sure to come, and good maps can only be satisfactorily designed after considering the points here discussed.

It is not yet, I think, generally recognized that a really good topographical map, based on triangulation, may be produced on a scale of about $\frac{1}{2}$ inch to the mile at very moderate expense if unimportant detail is left out and survey and reproduction carried out as economically as possible. Such a survey has recently been carried out in the Orange River Colony, a country mainly agricultural with generally poor land. There must be few parts, other than barren and mountainous regions, under settled government where such a survey would not be of value. I believe that in future still further economy in surveying and mapping will be attained, and this will stimulate the undertaking of fresh surveys.

Meeting, as we are privileged to do this year, in Canada, I should like to say a few words on the surveying and mapping of the Dominion. Until recently the only maps published have been on very small scales and have shown no ground forms. During the last few years, however, a regular topographical survey has been undertaken by the Militia Department. I am glad that for this topographical survey the scales of 1 inch and $\frac{1}{2}$ inch to the mile, both standard scales in Great Britain and Ireland, have been adopted. They are, in my opinion, suitable scales for Canada, and it is to be hoped that for any new mapping within the British Empire these or similar scales may be adopted as they have been in many parts. Uniformity in scales is very desirable.

Without committing myself to praise in every respect of the maps prepared by the Militia Department, I may say that they appear to me excellent, well-executed maps. Not many sheets have yet been issued, and they are probably not yet well known even in Canada; but I have little doubt that when known their value will be appreciated, and that the area mapped will be rapidly extended. There are no doubt large areas in Canada for which a smaller scale than 1 inch will suffice, but there can be few, except wastes and barren regions, for which maps on some scale will not be needed. To a country like Canada, which has made wonderful progress already, and which has a great future before it, adequate mapping must be of importance, specially so in view of the vast area of the country. I have misread the character of the Canadian people if they will be content with any except first-rate maps for the whole settled area of the Dominion.

I should like to have said a few words on the aid which good maps give to geographical education, but my address is already too long. I will only say that while good maps and geographical education are of use to all countries, they are of special value to the British Empire, whose different parts are geographically so scattered, but which are so closely bound together by common ties of kinship, interest, sentiment, and loyalty.

DR. HECKER'S GRAVITY SURVEYS.

The energy of geodesists, and especially of German geodesists, has been spent largely of late years on gravity survey, perhaps even to the undeserved detriment of triangulation; for the time being they have left the measurement of the Earth's size and shape, to study the distribution of matter within it. In recent and striking developments of this work Dr. Hecker has played a leading part, and we are glad that he has found time to put together the excellent account of the whole subject, which is given in the article under notice.*

The conspicuous name in the early history of gravity survey is that of the Ven. John Henry Pratt, the mathematical Archdeacon of Calcutta, who came to the aid of the Indian surveyors when they were puzzled by the problem, What effect has the attraction of the Himalayan mass upon the direction of the plumb-line in India? Called upon to explain a discordance of 5″ between the astronomical and geodetic amplitudes of a short meridian arc, Pratt showed that the attraction of the visible mass should have produced a discordance of 15″; whence by gradual steps he was led to the adoption of his celebrated hypothesis that the attraction of the visible mountain masses is in general compensated by a deficiency in the density of the material below. Geodetic triangulation, combined with astronomical latitudes, gives a slow and roundabout way of examining this interesting idea; comparative determinations of the coefficient g, made with an invariable pendulum swung at different stations, give a more rapid and direct method of studying the distribution of matter in the Earth's crust. Whoever, therefore, can afford the luxury, supplements and elucidates his comparisons—"astronomical *minus* geodetic co-ordinates"—by means of a gravity survey.

Dr. Hecker gives an excellent description of the v. Sterneck pendulum apparatus, followed by a clear account of the successive discussions made by Prof. Helmert as material accumulated. Pratt's hypothesis, in its general form, is fully established. The principal mountain masses that have been examined—Himalayas, Caucasus, Tyrol—are compensated by underlying deficiencies of density. The general compensation is nearly perfect; locally there are, of course, significant variations which are partly explained by, or help to explain, the broad geology of the district. Occasionally one finds abnormalities—the well-known deficiency under Moscow; the uncompensated excess in the Harz mountains; and Burrard's subterranean chain parallel to the Himalayas. But, in general, the continental masses are compensated.

There remained the problem, how to determine the variations of gravity over the ocean. Is the lightness of the ocean itself compensated by excess of density in the ocean bed? The answer had been foretold by Faye, who pointed out, very acutely, that gravity on oceanic islands is generally in excess by roughly the amount due to the mass of the island above the floor of the ocean. But an actual determination of gravity at sea was first made by Dr. Hecker, using the method suggested by Mohn of Christiania. At a given place there is a definite relation between the height of the mercury barometer and the boiling-point of water; when the apparatus is transferred to a place where gravity is different, this relation is altered. Hence we have a means of determining the variation of gravity by comparison of the mercury barometer and the boiling-point thermometer. And this method—at first sight unpromising—has been made to work at sea, in spite of

* "Die Schwerebestimmung an der Erdoberfläche und ihre Bedeutung für die Ermittelung der Massenverteilung in der Erdkruste." Dr. O. Hecker. *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, 1909, No. 6.

the plunging of the vessel and the consequent "pumping" of the barometer. Dr. Hecker gives a summary of the results of two long voyages with this apparatus—the second a circumnavigation of the world. Again the general result is to confirm Pratt's hypothesis. Gravity is normal at the surface of the ocean. Locally, as in the Tonga channel, there are irregularities. And there is a highly interesting oscillation in gravity as one passes outwards from a continent to the deep sea—

Within a continent	Gravity normal.
Coast and shallow sea	Gravity in excess.
Beginning of deep sea	Gravity in defect.
Deep sea	Gravity again normal.

We may congratulate Dr. Hecker on the establishment of this beautiful result, of a world-wide interest proper to the International Geodetic Bureau, under whose auspices it was obtained. We may express the hope that a full translation of the article under notice may be published in English; and that there may be an opportunity of adding some reference to the Indian pendulum results which have just appeared.

A. R. H.

THE NORTH POLAR EXPEDITIONS OF COMMANDER PEARY AND DR. COOK.

WITHIN a few days of one another telegrams appeared in the public press early in September from Dr. F. A. Cook and Commander R. E. Peary, each of whom announced that he had reached the North Pole. At present we propose only to summarize the narratives which have been published by the two explorers, in the order of their appearance, reserving any criticism or other expression of opinion till fuller information is available.

In the first place, in order that it may be seen how the two expeditions link on to previous explorations, we give below a table showing the stages of the gradual advance of exploring achievement in the direction of the North Pole by the West Greenland route during the past three hundred years.

Explorer.	Date.	Highest latitude. North.	Distance from the North Pole. Geographical miles.
John Davis	June 30, 1587.	72° 12′	1068
William Baffin	July 4, 1616.	77° 45′	735
E. A. Inglefield	August 27, 1852	78° 21′	699
William Morton (Kane Expedition)	June 24, 1854	80° 35′	565
C. F. Hall	August 30, 1870	82° 11′	469
A. H. Markham (Nares Expedition)	May 12, 1876	83° 20′	400
Lockwood and Brainard (Greely Expedition)	May 13, 1882	83° 24′	396
R. E. Peary	May 16, 1900	83° 50′	370
	April 21, 1902	84° 17′	343
	April 21, 1906	87° 6′	174

Dr. Cook's Narrative.

On September 1 brief telegraphic messages from Lerwick announced that the Danish Government steamer *Hans Egede* had arrived there on its way to Copenhagen from the Danish Government settlements in Greenland, where it had taken on board the American explorer Dr. F. A. Cook, who reported that he had reached the North Pole on April 21, 1908. Dr. Cook went north on board a schooner belonging to Mr. J. R. Bradley in the summer of 1907. The expedition was a pleasure cruise, but Dr. Cook was prepared to attempt to reach the North Pole if a favourable opportunity offered, and had organized his equipment accordingly. When the schooner returned south, Dr. Cook remained at Etah in company with the steward, Mr. Francke, and sent back word that he intended to make a "dash" for the pole by way of Nansen sound, which separates Ellesmere Land from Axel Heiberg Land to the west. He started from Etah early last year, accompanied only by some Eskimos and their dogs, and on March 17 sent back despatches to Mr. Francke from Cape Hubbard, the northernmost point of Axel Heiberg Land. In these despatches he stated that he hoped to be back in June; but when the *Erik*, the supporting vessel of Commander Peary's expedition, returned south in the early autumn of last year, Mr. Francke was still without further news of Dr. Cook, and, in accordance with his instructions, he left Etah on board the *Erik*. It was feared that Dr. Cook had lost his life while making his attempt to reach the pole, and the news received on September 1, that he was alive and had succeeded in attaining his object, came as a complete surprise.

The following summary of Dr. Cook's experiences after leaving Cape Hubbard is compiled from a lengthy despatch which he telegraphed from Lerwick to the *New York Herald*. The journey over the ice was begun from Cape Hubbard on March 18, but it was not until three days later that Dr. Cook commenced "the crossing of the circumpolar pack." The last of the supporting parties returned from this point, and Dr. Cook continued in company with only two Eskimos and twenty-six dogs. The low temperature and persistent winds were very trying, but long marches were made, and "the big lead which separated the land ice from the central pack was crossed with little delay." The weather conditions did not favour the taking of accurate observations; but on March 30 the sky partially cleared, and "over the western mist was discovered a new land." According to his observations, Dr. Cook's position was then 84° 47′ N. lat., 86° 36′ W. long. It will be remembered that on his journey westwards along the northern coast of Grant Land in 1906 Commander Peary sighted land to the north-west, which is shown on his map as crossing the 83rd parallel in about 102° W. long. Being anxious to continue his northward march, Dr. Cook did not turn aside to explore the land he sighted. He states that he now found

Commander Peary's Reported Track to the Pole ----------

Dr Cook's do do ——————

himself beyond the range of all life. The surface of the pack-ice offered less and less trouble, and long distances were covered every day. On April 8 he secured observations which gave his position as 86° 36′ N., 94° 2′ W. At this point of his narrative he states: "Much of our hard work was lost in circuitous twists around troublesome pressure lines and high irregular fields of very old ice. The drift, too, was driving eastwards with sufficient force to give some anxiety. . . . Beyond the 86th parallel the icefields became more extensive and heavier, the crevasses fewer and less troublesome, with little or no crushed ice thrown up as barriers. From the 87th to the 88th parallel much surprise was caused by an indication of land-ice. For two days we travelled over ice which resembled a glacial surface. The usual sea-ice lines of demarcation were absent, and there were no hummocked or deep crevasses. There was, however, no perceptible elevation and no positive sign of land or sea." The temperature remained below −40° Fahr., and as new lanes opened in the pack they were covered with young ice so rapidly that little delay was caused in crossing from one field to another. Later on Dr. Cook says, "Signs of land were still seen every day, but they were deceptive illusions, or a mere verdict of fancy . . . all of this was due to the atmospheric magic of the midnight sun." Finally, on April 21, Dr. Cook states that the first corrected altitude of the sun indicated that he had reached 89° 59′ 46″ N. lat. "We advanced the 14″, made supplementary observations, and prepared to stop long enough to permit a double round of observations." The temperature was −38°.

Cape Hubbard, as shown on Commander Peary's map in his book 'Farthest North,' is in 81° 15′ N.; so that to have reached the North Pole on April 21 Dr. Cook must have covered 525 geographical miles (leaving out of account deviations from a due north-and-south line) in thirty-five days—an average rate of progress northwards of 15 geographical miles a day.

The return march was commenced on April 23. With fair weather and good ice long distances were at first covered on the daily marches, but below the 87th parallel the character of the ice changed greatly; violent gales were encountered, and it became evident that the season was advancing rapidly. Observations on May 24 indicated that the party had reached the 84th parallel in the neighbourhood of the 97th meridian of west longitude. The ice was much broken, and there was an easterly drift. The 83rd parallel was reached, and then foggy weather ensued, which lasted for twenty days. At the end of that time the party found themselves far down in Crown Prince Gustav sea, to the west of Axel Heiberg Land, and separated therefrom by broken ice interspersed with so much open water that it was impossible to reach the island. Ultimately Jones sound was reached, and the winter was passed at Cape Sparbo, on the north coast of North Devon island.

Early this year the crossing to the west coast of Greenland was effected, and after visiting his base of supplies at Annootok, near Etah, Dr. Cook made his way south to Upernivik, where he arrived on May 21.

Commander Peary's Narrative.

Commander Peary's return on board his ship, the *Roosevelt*, was announced in telegrams received from Indian harbour, Labrador, on September 6. We summarize his story from a long telegraphic despatch to the *New York Times* a few days later, which appeared simultaneously in the London *Times*. The expedition wintered near Cape Sheridan, which was reached by the *Roosevelt* on September 5. The work of hunting and of transporting supplies was carried on till November 5, by which time the supplies for the great sledge journey in the spring had been deposited in depôts at various points between Cape Colan and Cape Columbia. In November and December, Mr. McMillan spent a month at Cape Columbia, taking tidal observations, while in January Mr. Marvin made an excursion across Robeson channel and on to Cape Bryant, where further tidal and meteorological observations were secured.

On February 15, the first division of the polar sledging party left the *Roosevelt*. Others followed, Commander Peary bringing up the rear on February 22. The march northwards from Cape Columbia was commenced on March 1. The party comprised seven members of the expedition—Commander Peary, Captain Bartlett, Mr. McMillan, Mr. Marvin, Mr. Goodsell, Mr. Borup, and Commander Peary's negro servant and faithful attendant on many expeditions, Matthew Henson; 17 Eskimos, 133 dogs, and 19 sledges. These were divided into sections, moving one in advance of the other; they were gradually sent back as the party advanced northwards and the supplies diminished. Rough ice on the first march damaged several sledges and smashed two beyond repair. Camp was pitched 10 miles out. On the following day, Commander Peary was stopped by a lead opened up by the wind after the pioneer division under Captain Bartlett had passed. A crossing was effected without much delay, but "the wind continued forming open water all about us. By the end of the fourth march we were all upon Bartlett, who had been stopped by a wide lake of open water. We remained here from March 4 to March 11. At noon on March 5 the sun, red and shaped like a football by refraction, just raised itself above the horizon for a few minutes and then disappeared again. It was the first time I had seen it since October 1."

On March 11 the lead was practicable, and the journey was continued northwards. The sounding of the lead showed a depth of 110 fathoms. The party crossed the 84th parallel, and traversed a succession of just frozen leads from a few hundred yards to a mile in width. On March 14 the leads were left behind, and the character of the ice improved. The

thermometer registered −59° Fahr. On March 16, apparently, "sounding gave a depth of 825 fathoms. We were over the continental shelf, and, as I had surmised, the successive leads crossed in the fifth and sixth marches composed the big lead and marked the continental shelf." Towards the end of the march "there were pronounced movements in the ice, both visible and audible. Some leads were crossed, in one of which Borup and his team took a bath." The temperature that night was −50° Fahr. A few days later, advancing in continual daylight, Commander Peary says, "We had no reason to complain of the going for the next two marches, though for a less experienced party, less adaptable sledges, or less perfect equipment it would have been an impossibility. At our position at the end of the second march Marvin obtained a satisfactory sight for latitude in clear weather, which placed us at 85° 48′ N. This result agreed very satisfactorily with the dead reckoning of Marvin, Bartlett, and myself. Up to this time the slight altitude of the sun had made it not worth while to waste time in observations."

For a time the going improved, though one lead was encountered which the party had to ferry themselves across on ice-cakes. "Next day Bartlett let himself out, evidently for a record, and reeled off plump 20 miles." Another satisfactory sight for latitude was obtained, the result indicating the position to be 86° 38′ N. "The conditions at this camp, and the apparently unbroken expanse of fairly level ice in every direction, reminded me of Cagni's description of his Farthest North; but I was not deceived by the apparently favourable outlook, for available conditions never continue any distance or any length of time in the Arctic regions. North the march was over good going, but for the first time since leaving land we experienced that condition, frequent over these ice-fields, of hazy atmosphere in which the light is equal everywhere. All relief is destroyed, and it is impossible to see any distance. We were obliged on this march to make a *détour* around an open lead. In the next march we encountered the heaviest and deepest snow of the journey, through a thick smothering mantle lying in depressions of heavy rubble ice. I came upon Bartlett and his party fagged out and temporarily discouraged by the heart-racking work of making a road. I knew what was the matter with them; they were simply spoiled by the good going on the previous marches. I rallied them a bit, lightened their sledges, and set them on encouraged again."

"During the next march," continues Commander Peary, "we travelled through a thick haze drifting over the ice before a biting air from the north-east. At the end of the march we came upon the captain camped beside a wide open lead with dense black water and sky in the north-west, north, and north-east. We built our igloo and turned in, but before I had fallen asleep I was roused out by a movement of the ice, and found a startling condition of affairs—a rapidly widening road of black water ran but a few feet from our igloo. One of my teams

of dogs had escaped by only a few feet from being dragged by the movement of the ice into the water. Another team had an equally narrow escape of being crushed by ice-blocks piled over them. The ice on the north side of the lead was moving around eastward of the small floe on which we were, the captain's igloo was drifting eastward in open water, and the side of our igloo threatened to follow suit. Kicking out the door of the igloo, I called to the captain's men to pack the sledges and be ready for a quick dash when a favourable chance arrived. We hurried our things on the sledges, hitched the dogs, and moved on to a large floe to the west of us. Then, leaving one man to look out for the dogs and sledges, we hurried over to assist the captain's party to join up. A corner of their raft impinged on the ice on our side. For the rest of the night and during the next day the ice suffered the torments of the damned, surging together, opening out, groaning, and grinding, while the open water belched black smoke like a prairie fire. Then the motion ceased, the open water closed, the atmosphere to the north cleared, and we rushed across before the ice should open again."

After this excitement the ice conditions were again very varied—first a succession of laterally open leads, then some heavy old ice; next a layer of young ice, "some of which buckled under our sledges," and then more heavy old floes covered with hard snow. For the first time, also, since the first few days of the march, a strong north wind was encountered, bitter and insistent, "pressing to the south the ice over which we had travelled, and so robbing us of 100 miles of advantage." By this time Captain Bartlett was the only white man left with Commander Peary, and in lat. 87° 48′ N. he also was sent back. The observation, taken in clear weather, "showed that the continued north wind had robbed us of a number of miles of hard-earned distance." Captain Bartlett was anxious to continue, but it had been arranged that he should return at the 88th parallel. He had borne the bulk of the pioneering work, and Commander Peary pays high tribute to his services.

There were now left with Commander Peary only his negro servant Henson and four Eskimos. The date, presumably, was April 1. Few dates are mentioned in the long telegraphic despatch, but in an earlier summary of the stages of his advance, Commander Peary states that he crossed the 88th parallel on April 2. After Captain Bartlett's departure he planned to attempt to reach the North Pole in five forced marches. The narrative is a little difficult to follow, but we give Commander Peary's statements as contained in the telegram appearing in the *Times*. A start was made a little after midnight. "A good pace for about ten hours—25 miles—well beyond the 88th parallel. . . . A few hours' sleep, then on the trail again, with the sun circling now practically horizontal. . . . Ten hours—20 miles—and halfway to the

89th parallel, the ice grinding audibly in every direction, but no visible motion. . . . Again a few hours' stop, and we hit the trail before midnight. The weather and the going were even better, as the surface, except where interrupted by infrequent pressure-ridges, was as level as the glacial fringe from Hecla to Columbia, and harder. A march of something over twenty hours, the dogs often on the trot—20 miles. Near the end of the march we rushed across a lead 100 yards wide, which buckled under our sledges and finally broke as the last sledge left it. In sight of the 89th parallel; temperature −40°. Again a snatch of sleep, and on once more over the 89th parallel, this being a duplicate of the previous march as to weather and going; the last few hours on young ice of a north-and-south lead, the dogs occasionally galloping—25 miles or more, the air, the sky, and the bitter wind burning the face till it crackled. It was all like the great interior ice-cap of Greenland. Even the natives complained of the bitter air. It was as keen as frozen steel. A little longer sleep here, as we were all in need of it, then on again. . . . The weather was thick, but it gave me no uneasiness. I had taken an observation, which indicated our position as 89° 25′. A dense lifeless pall overhead, black at the horizon, and the ice beneath a ghastly chalky white with no relief—a striking contrast to the glimmering sunlit fields over which we had been travelling the previous four days. The going was even better, and there was scarcely any snow on the hard granular last summer's surface of the old floes, dotted with the sapphire ice of the previous summer's lakes. A rise in temperature to −15° reduced the friction of the sledges and gave the dogs the appearance of having caught the spirits of the party. The more sprightly ones, as they went along with tightly curled tails, frequently tossed their heads with short, sharp barks and yelps.

"Twelve hours—40 miles—and no sign of a lead in the march. I had made my five marches, and was in time for a hasty noon observation through a temporary break in the clouds, which indicated our position as 89° 57′. I quote from my journal some hours later—

"'The Pole at last. The prize of three centuries, my dream and goal for twenty years, mine at last.

"'Cannot bring myself to realize it. It all seems so simple and commonplace. As Bartlett said on turning back when speaking of his being in these exclusive regions, which no mortal had ever penetrated before; it is just like every day. Of course, I had many sensations that made sleep impossible after the first three hours; utter fatigue, or, perhaps, the sensation of a lifetime, but no room for them here.'"

"The thirty hours passed at the pole were spent in observations, in going some 10 miles beyond the camp, and some 8 miles to the right of it, taking photographs, planting my flags, depositing records, studying the horizon with my telescope for possible land, and searching for a

practicable place to make a sounding. Ten hours after our arrival the clouds cleared before a light breeze from the left, and from that time until our departure in the afternoon of the 7th the weather was cloudless and flawless. The minimum temperature during the thirty hours was −33, and the maximum −12."

Cape Columbia being in about lat. 83° N., Commander Peary, to have reached the North Pole on April 6, must have covered 420 geographical miles, measured in a straight line, in thirty-seven days, an average of over 11 geographical miles a day. If allowance be made for the seven days he was delayed by the big lead—March 4 to March 11—his average rate of progress northwards would be 14 geographical miles a day. After Captain Bartlett's return he covered, on each of his five forced marches, much longer distances than this. The return journey was commenced on April 7, and Cape Columbia was reached sixteen days later, on April 23, an average rate of progress southwards of 26 geographical miles a day. The point where Captain Bartlett turned back, 132 geographical miles from the pole, was reached, Commander Peary states, in three marches, the last march being made "in the wild sweep of a northerly gale, with drifting snow and ice rafting under us as we dashed over." Regularly on the homeward journey "five outward marches [were covered] in three return marches."

Five miles from the pole the last sounding was taken. "All my wire, 1500 fathoms, was sent down. No bottom. In pulling up the wire it parted a few fathoms from the surface, and the lead and wire went to the bottom." Open leads were still encountered, but "the movement of these leads was simply open and shut. . . . At no single lead were we delayed more than a couple of hours." The trail was kept without difficulty down to the tenth outward igloo. Then it disappeared completely, and the entire region was unrecognizable. The trail was picked up again north of the seventh igloo, followed to beyond the fifth igloo, and at the big lead was lost finally. At Cape Columbia two days were given up to sleep and to the drying of clothes. Then two marches carried the party to the *Roosevelt*, where Commander Peary learned that while returning from the northward journey with one of the supporting parties, Mr. Marvin had been drowned in the big lead.

The *Roosevelt* left her winter quarters on July 18, the interval having been spent in excursions for the taking of tidal observations and soundings. Indian harbour was reached on September 5.

To Commander Peary, as a Gold Medallist and Honorary Corresponding Member of the Society, the President addressed on September 7 the following telegram: "*Delighted to hear of your safe return. Warmest congratulations.*—DARWIN, *President R.G.S.*" With respect to the claims of both Commander Peary and Dr. Cook, the final decision must await the examination of their scientific observations.

REVIEWS.

ASIA.

Himalayan Travels.

'Five Months in the Himalaya: a Record of Mountain Travel in Garhwal and Kashmir. By A. L. Mumm. London: E. Arnold. 1909. *Price* 21*s. net.*

In 'Five Months in the Himalaya,' Mr. Mumm gives an account of a mountaineering expedition undertaken together with Dr. Longstaff and Major Bruce to the ranges in Garhwal, and afterwards with Major Bruce to Kashmir and Khagan. Two of the party, Longstaff and Bruce, had been on mountaineering expeditions amongst the Himalaya before; indeed, there is no one who can compare with Major Bruce in knowledge of the great ranges on the north of India—almost every year he has been amongst them since he made his first big expedition with Sir Martin Conway to the Karakoram range in 1892.

A visit to the ranges in Garhwal was not the original intention of the party; a far more interesting expedition had been planned, namely, one to Mount Everest, the highest peak of the Himalaya. This had been suggested in 1905 by Lord Curzon, then Viceroy of India, in a letter to Mr. Douglas Freshfield; Lord Minto, who succeeded Lord Curzon, was also in favour of such an expedition, and expressed his willingness to forward such a visit to Everest by every means in his power. One thing alone was wanted to complete the matter—the permission of the India Office at home. Unfortunately this permission was never given; whether it was due to the authorities having only a vague notion where Everest was, or imagining that it could only be approached through a country peopled by wild and lawless Tibetans who would maltreat any foreigners who penetrated into their country, or whether they were apathetic on the subject of mountain exploration, we shall probably never know, the fact remains that Mr. Morley flatly refused permission. As Mr. Mumm remarks, "His refusal was the more annoying inasmuch as it was a matter of common knowledge that a few months earlier the Swedish explorer, Dr. Sven Hedin, had, to all intents and purposes, made use of British territory as a base for an exploring expedition in Tibet of a much more extensive nature than that which we had in contemplation." So the party went to Garhwal instead, and were rewarded by the ascent of Trisul, 23,360 feet high.

The group of mountains in Garhwal, of which Trisul is the second highest summit, culminates in Nanda Devi, 25,645 feet, and lies a little to the south of the watershed separating the Sutlej from the Ganges.

Mr. Mumm's party attacked these mountains from the Dhauli valley on the west. Here they found just the same difficulty that Mr. Graham experienced in 1883, in getting up the narrow gorges that come down from the snow-peaks. The description of how the camp was moved up the Rishi gorge is an excellent example of the enormous difficulty that often has to be overcome in virgin country, before the great peaks themselves are reached. Although the Nanda Devi glacier lay at the head of the Rishi ravine, the party found it impossible to get their camp up to it. The glaciers coming from Trisul were more easy of access. The first attempt on Trisul was unsuccessful. A camp was made at over 20,000 feet, but the weather was far too wild to allow any further progress. At this altitude at least one of the party, Moritz Inderbinnen, a Swiss guide, suffered from the rarity of the air. To cure him, Mr. Mumm tried one of those modern scientific panaceas that mountaineers often are so fond of, and imagine are indispensable. As is often the case, the result was not quite what was expected; to quote Mr. Mumm, "I thought this was an

excellent opportunity of testing the pneumatogen cartridges, and tried to show him how to inhale, but it only made him sneeze, and after one or two half-hearted efforts, he said lugubriously, 'I suppose that will be enough, sir.'"

A few days later Dr. Longstaff, with two Italian guides, Alexis and Henri Brocherel, and Kharbir, one of the 5th Gurkhas, successfully ascended Trisul. They started, however, from a much lower camp, namely at 17,450 feet, and therefore had to climb about 6000 feet. The time taken to reach the summit from the camp was ten hours. It certainly was a magnificent effort, yet none of the party seemed to trouble whether or not the ascent had established anything in the nature of a "record." Perhaps in this age when "records" stand for so much, this may appear strange, yet most certainly this modesty is preferable to the opposite extreme of trying to discredit the performances of other people in order to establish one's own.

After this the party went north to the Raikana glacier and Kamet (25,447 feet), that lies on the Sutlej-Ganges watershed, but they were unable to accomplish more than a reconnaissance of the peaks. Dr. Longstaff then returned to the Trisul nullahs to map the country, whilst Major Bruce and Mr. Mumm went to Kashmir, where they ascended Haramukh, and then went westward to the Khagan range and climbed Shikara.

To those who take an interest in the Himalaya and in mountaineering the book will be most welcome; it is splendidly illustrated, and the story is told by Mr. Mumm in a manner that carries one on from the beginning to the end.

The two maps are not as complete as one could wish, for a good many places mentioned in the book have not yet been entered on the maps.

The book is a very substantial addition to mountaineering literature, and the work done by the expedition has added a great deal to our knowledge of the geography of the Nanda Devi group of the Kumaun Himalaya.

J. N. C.

AFRICA.

The Algerian Sahara.

'Missions au Sahara.' Par E.-F. Gautier et R. Chudeau. Tome 1. Sahara Algérien. Par E.-F. Gautier, Chargé de Cours à l'École supérieure des Lettres d'Alger. *Maps and Illustrations.* Paris: Librairie Armand Colin. 1908. 15 *francs.*

M. Gautier gives us in this book the fruit of scientific researches made during various journeys in the Sahara in 1902–6, sometimes alone, sometimes in company with Mons. R. Chudeau. 'Sahara algérien' is concerned, mainly, with the region between Figuig and Ahnet; in a companion volume M. Chudeau is to deal with 'Sahara soudanais.'* This division is made for conveniency, but there are physical features justifying it, notably the contrast in the visible vestiges of the Quaternary age. Thus, in the north deep erosion of the river-beds, in the south "fossil dunes" are the characteristic features. That shows (says M. Gautier) that in the north the desert has followed the steppe, and in the south the steppe the desert, an important fact, adds the author, never yet clearly manifested. Into his investigations and speculations there is here no space to enter at length. All that can be done is to indicate somewhat more fully the contents of the volume. It having been arranged that M. Haug shall deal with the palæontological results of his expeditions, the author devotes the larger part of his treatise to an endeavour to make plain the "architecture" of the country—much as the archæologist clears out the ruins of a sand-buried temple.

Geology (and specially stratigraphy), therefore, bulk largely in the book; topography is lightly treated, and narratives of his journey are entirely lacking, the

* Since the above was written, M. Chudeau's volume has appeared (vide *infra*, p. 469)

author preferring a synthetic exposition of the conclusions at which he has arrived. Among these conclusions is a northerly course for the Niger, perhaps within "historic" times. According to this theory, the Niger, about where Timbuktu now stands, went north, and emptied into the depression known as the Juf. In Lake Faguibine M. Gautier sees a remnant of this ancient bed of the river. At the same doubtfully historic period the Wad Messaud ("the joyous river"), a continuation of the Wad Saura of Tuat, running south-west, also emptied into the Juf, then the common receptacle of all the streams coming from the Atlas in the north and the Futa Jallon in the south. The Niger and the Wad Messaud were there neighbours, "establishing thus a line of verdure and of life across the Sahara, and precisely in the region to-day the most desolate." It is as the result of M. Gautier's investigations that the Wad Messaud, the existence of which was a point in dispute, appears on the map for the first time with a definitely ascertained course. The causes of the desiccation of the Sahara are said to be not climatic, but "mechanical," the process—a river choked by its own sandy bed, aided by the action of the wind—can be witnessed to-day. The author believes that the *ergs* mark the course of ancient rivers. Where these vanished rivers had left sandy plains the wind has created dunes.

A most interesting chapter is devoted to Saharan ethnography, and here the distinction between the northern and southern regions is disregarded. The sources of information are stone monuments (chiefly tombs), rock pictures, and neolithic arms and tools. This problem has been the subject of several previous inquiries, but M. Gautier adds appreciably to the facts hitherto known. His general conclusion is that in scratching the Tuareg one finds the negro whom he (the Tuareg) has "recently" supplanted; in other words, that there was, perhaps as recently as the Roman epoch, a Sahara still neolithic and peopled by an agricultural negro race which extended north to the confines of Algeria.

Having in his first three chapters dealt in generalities, the author proceeds to give monographs on particular districts—the Zousfana, Saura, Tuat, etc. The fifty-two full-page plates (ninety-six photographs) are an excellent feature of the book, which has also valuable maps, including two geological maps in colours.

F. R. C.

Cyrenaica.

'Report on the Work of the Commission sent out by the Jewish Territorial Organization to Cyrenaica.' By Prof. J. W. Gregory and others. Pp. xiii. + 46. *Illustrated.* Ito Offices. 1909. 5s.

The ancient fame of the Cyrenaica as a populous Jewish colony, its convenient situation in the Levant, travellers' reports of its excellent climate and high fertility, and the desire shown by the local authorities to promote its re-settlement, all combined to indicate it to the Jewish Territorial Organization as a likely region for the solution of the difficult problem with which this organization is pre-occupied. This problem is to find a pleasant district, more or less like that from which the Jews originally came, which is not yet settled up, and where colonists would be acceptable to and protected by the authorities. The Cyrenaica has long been an object of Ottoman anxiety, and more than one official attempt has been made to introduce a settled element from outside among its sparse and nomadic, but very well-armed population. Some years ago an abortive experiment was tried with Kurds, and, after 1898, a more successful effort was begun to induce the Cretan Moslems to take refuge there. But the Cretan settlement was on a small scale and confined to two or three localities only, and there remained ample room for others. The late Marshal Rejib Pasha, while *vali* of Tripoli, showed much favour to a tentative scheme

propounded by Dr. Nahum Slousch in 1906—a scheme whose first suggestion seems to have been due to Sir Harry Johnston; and, though Cyrenaica was not in his *vilayet* (it is a distinct *sanjak*, dependent directly on the Ministry of War), he made all easy for an expedition of inquiry which the Ito authorities were wise to organize. This was entrusted to the well-known geological explorer, Prof. J. W. Gregory of Glasgow, and included an engineer and water expert, Mr. M. B. Duff; Dr. M. D. Eder, medical officer and zoologist; and Mr. J. Trotter, expert in agriculture and botany. The report of what they saw in Cyrenaica in the summer of 1908 is now before us, and a very interesting and valuable document it is. Their investigations were rather rapid and summary and confined to main traffic lines; but they are the first made in Cyrenaica by a combination of scientific geographical experts. To say this is not to decry the work done in 1881 by the Italian mission of Camperio and Haimann, for that had a different object, and its members had other qualifications. Mr. Israel Zangwill supplies an historical and political preface. This would have been more valuable if its brilliant author had taken more trouble to get up his subject. He does not know enough of the facts about recent Cyrenaic exploration (*e.g.* he speaks of an English expedition "of six or seven years ago," meaning Mr. Weld Blundell's in 1895, and is ignorant of the American party which went to Cyrene in 1904) to inspire confidence when he writes on the policy of the Ottoman authorities and the present state of the country. But when we get to the main body of the Report, we are on much better prepared ground, and, so far as they go, the observations and opinions of Messrs. Gregory, Duff, Eder, and Trotter will have permanent value. They agree in thinking the fertility and economic capacity of Cyrenaica much exaggerated. They find the rainfall deficient, and the geological character of the region ill adapted to render such rain, as falls, available for an increased population. The arable areas of any value are not large, and there are already somewhat too many inhabitants, and these over well-armed and inclined to be truculent.

Certain reservations, however, suggest themselves to any one reading this report. The only trustworthy records of rainfall, which the expedition could obtain, were at Bengazi. There the average is hardly above 10 inches per annum. But how far is an average, taken on low ground close to the edge of the Syrtis desert, a reliable indication of the precipitation on the highlands of Jebel Akhdar much further north and east, or even of that on the Slunta downs? The expedition travelled in August, when all springs and wells are at their lowest, and it dared not go off main tracks for fear of missing water altogether. It was assured in Derna that only on these were there any wells. But even if the Ottoman authorities intended that it should see the country thoroughly, did the local Arabs so intend? We doubt it, and we can believe there is a good deal more water even in August than the expedition heard of. The effort made by Messrs. Zangwill and Gregory to cut down the ancient population of Cyrene and Cyrenaica is against the authorities and the evidence of ancient remains, and is not convincing.

The Ito organization does not, however, seem to have abandoned all hope of Cyrenaica; nor is the final opinion of Mr. Gregory and his colleagues altogether condemnatory. We should be glad to hear they intend to go there again with a little more time to spend, and in the spring season. Without echoing the rhapsodies that have been written about Cyrenaica, we still hold it a land with some exceptional advantages of climate, surface, and situation, capable of supporting a very considerable population, if this installed itself with due energy, foresight, and hydraulic appliance.

D. G. H.

AMERICA.

Chile.

'Landeskunde von Chile aus den Nachlass von Dr. Carl Martin, für den Druck durchgesehen von Prof. Dr. Paul Stange. 73 *Illustrations and Map.* Hamburg: Friederichsen. 1909.

The preparation of this great book of eight hundred pages was the main object of the author during a residence of nearly thirty-four years in Chile. It might be described as a sort of universal gazetteer, with long preliminary chapters on the natural history, geology, climate, agriculture, and mining, as well as Church and State. But nearly two hundred pages are devoted to special detailed description of the separate provinces.

The author has spared no pains in the production of what must be considered a valuable work of reference. No human being could obtain a complete mastery of all these sciences, so that there is a certain inequality in the preliminary chapters. When dealing with the flora and fauna, Dr. Martin had safe guidance in the writings of the Philippis and Dr. Reiche, and some of his chapters, such as those on the Chilean palm, Araucaria forests, and other coniferous woods, are clear, detailed, and of much practical importance. So also with his brief account of the animal life of Chile, which is interesting and useful. The part concerned with the geology and climate does not, perhaps, explain very well the complex conditions in a particularly difficult country. There is also in this volume the very full descriptions of Easter island, Juan Fernandez, and the Chiloen group, which seems to consist for the most part of unpublished and interesting material. Yet even in the full account of Chiloe, which was for some time Dr. Martin's home, we miss any adequate account of the experiences of those Londoners who attempted to form a colony, and of the climate and soil of those rain-soaked islands.

In the general body of the work there is an enormous mass of compressed information. The population even of quite small villages is given in detail, as well as the character of the roads and the special industries in their vicinity. The labour involved in the collection of all this material must have been enormous, and, so far as one can judge, there are few inaccuracies. Nor is it only on such points as these that one can obtain facts about Chile, for if one thinks of any practical question, one can usually obtain the answer, after a little examination. The amount of milk usually given by a Chilean cow, and the constitution of the cazuela, rightly described as a *smackhaften Suppe*, and, indeed, an infinity of useful practical matter can be discovered somewhere in this volume. But a person quite ignorant of Chile might fail to obtain the right impression upon many subjects of the first importance. The author has been extremely cautious and diplomatically evasive on those points on which the susceptibilities of the Chilean Government might be aroused. Still, for German colonists and commercial travellers the book should be indispensable, and, seeing that the voyage to Chile is long and tedious, it can safely be recommended to all visiting that country who have a good working knowledge of the German language.

One cannot blame the author for the unusual spelling of some Spanish names, but we were not aware that the author of 'The Highest Andes' was Lord Fitzgerald. There are seventy-three illustrations (photographs, with two coloured plates), a useful map, a somewhat confused bibliography, and index.

G. F. S. E.

Bolivia.

'La Bolivie.' By William van Brabant. Paris: J. Lebègue et Cie. [1908.] 10 *fr.*

The author deals with Bolivia from many points of view. The historical, ethnographical, and geographical sections only occupy about sixty pages in a book which contains nearly five hundred. The greater part of the work is devoted to information intended to appeal to settlers, and consists of detailed accounts of the economic development of the country and the regulations relating to concessions and the status of immigrants.

There is a valuable description of the plants grown in Bolivia which are of use in medicine.

Means of communication are well described, though the maps given are confused and hard to follow. At present the most important railway runs to Antofagasta, and the journey takes three days for goods traffic. A line now being built from La Paz to Arica will bring the former town within about twelve hours of the coast. The completion of the connections with the Argentine will also be helpful to trade in the near future. River navigation on the tributaries of the Amazon and on the Paraguay and Pilcomayo exists, but there is much overland transit before the navigable portion of the rivers can be reached. The author rightly emphasizes the importance of improvements in means of communication, without which the magnificent natural resources of an inland region like Bolivia cannot be developed.

The French West Indies.

'Les Petites Antilles.' By P. Chemin Dupontès. Paris: E. Guilmoto. 1909. 7.50 *fr.*

The author gives a very interesting account of the geography of these islands and their economic condition. The present distress, which is especially noticeable in the French Antilles, is attributed to the lack of interest shown in these colonies by France. It is pointed out that improved administration, and experiments in the introduction of varied products, such as cocoa, coffee, tobacco, fruit, and cotton, for which the soil and climate of most of the islands are suitable, would go far to remedy the economic disadvantages under which they now labour. Illustrations are drawn from the improved financial condition of the British West Indies, and an appeal made to the French Government to take the matter in hand.

MATHEMATICAL AND PHYSICAL GEOGRAPHY.

Geomorphology.

The Face of the Earth.' By Prof. Eduard Suess. Translated by Hertha B. C. Sollas, under the direction of Prof. W. J. Sollas. Oxford: Clarendon Press. 1908. 18*s. net.*

The concluding volume of Prof. Suess's great work, of which this is the first part, is devoted to the consideration of the structural features of the continents, the plan of the trend-lines traced by Nature on the face of the Earth. He places us in imagination before the map of Eurasia and proceeds to expound the tectonics of that portion of the world. The great chains of folded mountains which hang like festoons across Asia from Japan to the Urals and the Caucasus are the subject of his discourse. To the north-west of Lake Baikal lies a semicircular area of the Siberian plains, composed of very ancient rocks eroded into a tableland. This is the "vertex," or forehead of Asia, a district which has been little disturbed or folded since early Palæozoic time, and around it sweep the great arcs of folded ranges from Manchuria through the Gobi Desert and the Tian Shan to the Ser Darya and the mountains of Armenia. Lake Baikal, at the south-east edge of this plateau, is situated in a region of subsidence, cut up by faults. Another belt of

fractures, characterized also by subsidence and the formation of lakes, lies to the north-west of the vertex and separates it from the Gobi Altai, another region of ancient rocks which has exhibited great stability. A secondary or younger vertex lies in the Altai mountains. Far away to the south are the great rigid masses of peninsular India and Australia. Between these the whole of Asia is traversed by crowded folds, describing great curves, sometimes uniting in a syntaxis and suffering numerous deflections where one system encounters another or is turned aside by rigid districts like the Ordos or the "Sinian mole" which lies to the north-east of the Kuen-Lun mountains.

The analysis of the tectonics of Asia which Prof. Suess presents in this volume is marked by profound scholarship and almost superhuman breadth of view. The work is a great classic of geological research, and though, as its author points out, many of the conclusions arrived at are merely provisional, there is no doubt that it will keep its place in the literature of geology. It is a very difficult book to read, but there are portions of it, like the description of the vertex, the contrast between the fresh-water and saline deposits of Central Asia, and the two kinds of movements which have affected the eastern Alps, which are as readable as they are brilliant.

Miss Sollas's translation maintains its high level of excellence, and is in every way worthy of the book. It has much of the fluency and eloquence of the original, and avoids diffuseness as well as obscurity. Prof. Sollas has acted as general editor, and has been assisted by a number of eminent British geologists, but the original German edition has been followed as closely as possible. This is, no doubt, wise under the circumstances, though it has distinct inconveniences. Thus the illustrations have their topographical names in German, but in the text the English forms are mostly used. We note, also, that in the map the explanation of the colour scheme, omitted in the German edition, is also omitted in the English one, though it has been given by the French translators.

J. S. F.

Botanical Geography.

'Œcology of Plants. An Introduction to the Study of Plant-Communities.' By Eug. Warming, assisted by Martin Vahl. Prepared for publication in English by Percy Groom and Isaac Bayley Balfour. Oxford: Clarendon Press. 1909. Pp. i.–xi. and 1–422. *Price* 8*s.* 6*d. net.*

That interesting development of geographical botany which is clumsily described as œcology depends upon a classical work by Prof. Warming, which was translated into German in 1896. Schimper's 'Plant Geography' appeared in 1898 (in English in 1903); Prof. Clements, in America, published, not a translation, but an original work also in 1903, but English readers have had to wait some thirteen years for any adequate account of Warming's classical researches.

The book under review is, of course, much larger and more elaborate than the original; the author has included all the more important recent observations, and this volume must surely rank as the best modern textbook of a very difficult subject. The first three sections are concerned with the various climatic factors, light, heat, and atmospheric humidity. The chapters dealing with the aëration, depths of water in, and characters of soils are very complete, and these, as well as others which explain the effects of a vegetable covering on soil, of man's interference with vegetation, and of the influence of one plant community upon another, are not only clear, concise, and original, but of the first importance to practical agriculturists, foresters, and geographers.

The major part of the book is, of course, descriptive. Every formation and association in each of the thirteen classes is explained in detail, along with the

special adaptations to its own peculiar climate and soil, which naturally involves a description, in brief, of every type of vegetation on the whole Earth's surface. In the concluding section, Prof. Warming deals with the struggle for existence amongst the various plant communities, with the formation of new land by plants, and with the succession or change of one type of vegetation into another. All these chapters are exceedingly interesting, and especially the last, on the origin of species, which is a valuable contribution to the theory of evolution.

The most difficult and most important part in the study of plant-communities is to distinguish and classify the particular types. These classes are characterized as follows:—

(*a*) The soil is very wet. 1. Water plants and 2. Marsh plants.

(*b*) Soil *Physiologically* dry, which means that though water may be present even in abundance, it is not available for plant life. 3. Formations of very cold but not peaty soil (polar and high alpine). 4. Sour (acid) soil (tundras, peat-moss, moorlands, and arctic bushlands). 5. Salt plants (Zostera, saltwort, and mangrove formations).

(*c*) Soil *physically* dry and of more influence than climate on the life of plants. 6. Rock and gravel plants. 7. Sand-dunes and shingle. 8. "Formations on waste-land."

(*d*) Climate very dry, as in: 9. Desert and steppes. 10. Tropical savannahs. 11. Hard-leaved bush or forest, such as the Mediterranean *maqui*.

(*e*) Soil physically or physiologically dry (at least, that is how we understand it, for there seems to be an unfortunate misprint here), which includes only 12. Coniferous formations.

(*f*) Soil and climate of a moderately humid character, which contains arctic and alpine mat herbage and mat grasslands, meadows, pastures on cultivated soil, as well as evergreen and deciduous forests both temperate and tropical.

This classification seems to be a revised form of that originally adopted by Warming, and differs entirely from Schimper's method, which depends on climate.

At first sight this new classification seems both ingenious and particularly definite and clear, but the practical application of it in the field may be a little difficult.

It is not generally realized that this science of plant-communities is of great practical importance and not merely a botanical diversion. An expert should be able, in a new country, to judge from the character of the natural flora exactly what the land is capable of producing, or, at any rate, what are the most promising crops for experiment. But if a traveller were to attempt to classify the vegetation, say, in Australia or in Central Africa by means of this handbook alone, it is possible that he might find difficulties. These difficulties are not insuperable; there is nothing essentially mysterious in the most interesting science of plant-communities, nor is there anything in this volume which is unintelligible, but unfortunately there is an alarming display of formidable technical terms.

It will be most unfortunate if those who are likely to make the best use of this volume should be daunted by the clumsy name given to its subject, by the oxylophytes, chersophytes, etc., which dominate almost every page. Beyond the pleasure which some people seem to enjoy from writing *helophyte* for marsh plant and *heliophobous* for shade-loving, it is difficult to see why this unnecessary terminology should have been introduced. It will be a thousand pities if this valuable book should miss its full effect merely on account of its alarming appearance. It is in reality quite clear and easily read.

There are, of course, many points in which botanists would not immediately concur except on the high authority of the author. Must one believe, for instance,

that the soil in all coniferous forests is either physically or physiologically dry? There is an indefiniteness in the term "formation of waste land." Our common bracken occurs in this class, but in Scotland bracken overgrows many quite different formations. For instance, it will cover permanent pasture, dry heather moors, clearings in pine forests or in deciduous woodlands. So that there are many different formations in which bracken may become dominant.

Some botanists may have a certain feeling of regret that the author has not attempted to use the principle of succession for his classification. In one short sentence he describes how a marsh may change into a "low" peat-moss, which may become in time a "high moor" upon which a heather-moor may develop, and which may again be occupied by a Scotch pine forest, or in time by deciduous woods. This masterly description explains at once the greater number of the most important plant-formations in Northern Europe. If Prof. Warming could have utilized similar successions of development to explain other formations and associations, it would seem probable that most of the difficulties in its practical application would disappear.

But this work is one which should be indispensable to every British traveller, and perhaps may result in the British Empire being at last botanically surveyed on thoroughly modern methods. It is hoped that it is correct to assume that the book is entirely the work of Prof. Warming. The two distinguished botanists who have "prepared it for publication in English" would no doubt have marked their own contributions if they had collaborated in its production.

The book contains neither illustrations nor maps, but there is an excellent bibliography and a very full index.

G. F. S. E.

Hydrographic Surveying.

'Hydrographical Surveying.' By the late Rear-Admiral Sir William Wharton. New edition, revised and enlarged by Rear-Admiral Mostyn Field. London: Murray. 1909. 21*s. net.*

Originally published in 1882, this work has since been considered the standard work on the subject. A second edition was issued in 1898, to bring it up to date, since when the lamented death of the author has occurred. A further edition being now called for, this has been very ably and appropriately prepared by the author's successor as hydrographer, who, avoiding as far as possible any alteration in the text, has added many new features, including descriptions of useful expedients devised by present-day surveyors.

The increased size and draught of modern vessels more than ever necessitates the greatest attention to very close sounding in order to detect all irregularities of the latter, and ensure that no hidden dangers exist. Much additional useful information is given on this important point. In connection with searching for vigias or banks in deep water, the practical effect of a better knowledge of the nature of the slope of the bottom at different depths is also dwelt on. In an extended survey, differences will always occur between resulting positions obtained by triangulation and by astronomical observations; a practical method of satisfactorily co-ordinating them is described. Irregular methods of triangulation are illustrated by a large number of interesting practical examples, which are all the more valuable as being actual cases that have occurred in practice, and which show the value of the exercise of mathematical ingenuity in overcoming difficulties and so obtaining successful results in cases when otherwise a regular triangulation might be altogether impossible, or only to be obtained by the sacrifice and practical waste of much valuable time and labour. Many of the examples show the very great use

that can be made of the ship herself as a station in such cases, not necessarily even at anchor, but also under way. The use of photography for the reproduction of chart drawings on smaller scales is mentioned, together with examples of the special style of drawing consequent thereon. The introduction of portable chronographs fitted to chronometers for use in the field, is a successful extension in the field of the methods already employed in observations. The Pillsbury current meter, for the measurement of under-currents, is fully described with illustrations; also a simple method for the same purpose which has been successfully used in smooth water, and which requires no special apparatus. A description is given of a new and promising form of automatic tide-gauge, which consists of an indiarubber tube, one end of which is anchored in the water at a constant height above the bottom, the other being connected to a reservoir of compressed air on shore. The air is allowed to constantly and very slowly escape from the reservoir through the tubing, the regulation of which is rendered possible and very simple by means of a water-gauge showing visually the bubbles of escaping air. The varying pressure due to the height of the tide above the free end of the tubing is balanced by the pressure of air in the system; this can be periodically read off from a gauge, or continuously recorded as a curve on a diagram by means of a mercury tube, float, clock, etc. The same principle, using a Bourdon pressure gauge, graduated up to 300 lbs. pressure, instead of the automatic recording apparatus, has already been successfully used for ascertaining the rise and fall of tide from a ship at anchor in 35 fathoms, and promises to be of use in even greater depths. Should this prove to be so, much valuable information is likely to be obtained of the vertical movement of the tidal undulation away from the immediate proximity of land, and of which hitherto little or nothing has been definitely known. From the considerable difference of tidal range known to exist on directly opposite sides of some portions of the English channel and North sea, it is very important to further know the range in intermediate positions in order to supply data for the accurate reduction of soundings obtained to verify a ship's position in thick weather, as well as to trace the progress of the semi-diurnal tidal undulation.

The reviser is to be congratulated on the painstaking manner with which he has brought previous matter up to date, and on the large amount of additional information added to this useful branch of nautical science.

H. E. P.-C.

THE MONTHLY RECORD.

EUROPE.

Rainfall of Bedfordshire and Northamptonshire.—The rainfall of the above neighbouring midland counties has been studied by Dr. H. R. Mill* on similar lines to that of Kent, his discussion of which was referred to in the May number of this *Journal*. The period dealt with is the thirty-five years 1868–1902—a period long enough to afford a very close approximation to the true average rainfall for a much longer one. The average general rainfall of Bedfordshire is 24·43 inches, and of Northamptonshire 25·78 inches. In neither county is there any striking system of vertical relief which would exert a powerful influence upon the local distribution of rainfall over the area; nevertheless the chalk elevations of the Chiltern hills in Bedfordshire and the Oolitic limestone hills in Northamptonshire cause a decided increase in the annual amount of precipitation in comparison with the low-lying parts of the counties. The greatest difference

* See Memoirs of the Geological Survey of England and Wales, 1909.

that occurs in either county is in Northamptonshire, where, in the valley of the Nen below Northamptonshire, there is as little as 22·5 inches of annual rainfall; and among the Oolitic hills in the western portion of the county, as much as 27·5 or even 30 inches. In both counties the wettest month is October, as in most parts of England, but owing to the comparative frequency of local thunderstorms July gives the next highest average rainfall; the driest month is March. In Bedfordshire the wettest year of the thirty-five was 1875, with an excess of 29 per cent., but 1872—the wettest year of the nineteenth century in most parts of the United Kingdom—had an excess of 28 per cent. In 1903, however, just without the period for which the average is calculated, the excess was as much as 36 per cent. In 1870 there was a deficiency of 27 per cent. in Bedfordshire, and in 1887—the driest year on record in most parts of the British Isles—of 26 per cent. The rainfall of Northamptonshire exceeded the average by 35 per cent. in both 1872 and 1875, but curiously enough only by 24 per cent. in 1903, which was the wettest year ever recorded in some parts of England; it fell short of the average by about 29 per cent. in 1870 and 1887.

Cartography of the Provinces of France.—Sir H. G. Fordham, whose recent contributions to the history of British county cartography are well known, has also paid some attention to the historical cartography of the French provinces—a subject hitherto little, if at all, touched upon by English writers. He has given a sketch of the results of his inquiries, so far as they relate to the period 1570–1757, in vol. **13** of the *Cambridge Antiquarian Society's Communications*, the paper having also been issued separately. Sir H. Fordham approaches the subject avowedly from an artistic and bibliographical rather than a geographical point of view, and he makes little attempt to discriminate between the productions of the French map-makers as regards the value and accuracy of the data supplied. Nor has he much to say as to the authors or sources of the earliest maps of French provinces, which were afterwards adopted by the makers of atlases to whom his principal attention is directed. He merely remarks that, while the English maps of Saxton and his successors were based on an actual, if imperfect survey, in France no such attempt to compile maps on a systematic basis for the whole kingdom was made. The subject is no doubt a difficult one, though something has lately been done in France to throw light on the work of men like Jolivet, to whom some of the earliest local cartographical work was due. As a guide to the most important collections of local maps during the period in question the memoir is distinctly useful. The first collections of the kind were those of Ortelius and Mercator, which served as the basis for the much enlarged series brought out by Bougereau in his rare 'Théatre François' (1594) first adequately discussed by the late M. Drapeyron in 1889, and of which only four copies (one in the possession of Sir G. Fordham himself) are known to exist. A full description of this atlas forms the principal item in the present paper, the remainder of which is occupied with the work of Jean de Clerc, Melchior Tavernier, Nicolas Sanson, and Robert de Vaugondy, regarded by the author as the most representative geographers of the period dealt with. This is the case only, of course, from the special point of view of French provincial maps, for the omission of such names as Guillaume Delisle and J. B. B. D'Anville could not otherwise be justified. Facsimile specimens of the maps described accompany the paper.

Distribution of Population in Silesia is the subject of a paper by Dr. M. Groll in the *Zeitschrift der Gesellschaft für Erdkunde zu Berlin*, also issued as a reprint. Attached to the disquisition are three maps exhibiting, the first, the varied density of population in five grades of shading; the second, the industrial, agricultural, and mining areas, respectively; the third, the linguistic distribution of population. In the density map, besides the general horizontal distribution, the

relative population of the towns, ranging from over 5000 to over 100,000 each, is shown by dots of five different magnitudes. The bulk of the population is concentrated in Upper Silesia and the mountain zone. Lower Silesia, to the north of a line joining Görlitz and Kreuzburg, is thinly peopled, having in only a few localities over 130 to the square mile. Yet, leaving out of account the spacious forestlands, no considerable area of Silesia has less than 65 to the square mile. The mountain frontier and the greater part of Upper Silesia have from 300 to 500 inhabitants per square mile, the question of altitude apparently not affecting density one way or other. Outside the mountains, an industrial population crowds the districts of Beuthen, Rybnik, Malapano valley, etc. The rest of the Oppeln administrative division is mostly agricultural. A cluster of crowded places round Beuthen has a mean density of 5200 to the square mile. The confined basin of Waldenburg attains a density of 36,000 to the square mile. These two, with Rybnik, are the chief seats of mining and smelting. From 1,310,000 in 1871, Oppeln district had, in 1905, risen to a population of 2,036,000, *i.e.* from 254 to 480 per square mile.

The Tarntal Mountains, Tirol.—The *Geological Magazine* for August contains an article by Dr. A. P. Young on the "Structure and Physiography of the Tarntal Mass," illustrated by plates, map, and diagram. About 20 kilometres south-east of Innsbruck there is an isolated mountain mass known as the Tarntaler Köpfe, whose peaks rise to heights approaching 2900 metres, or over 9000 feet above sea-level. It is above the level of 2000 metres that the geological features claim special interest. The adjacent country to the north of the mountain mass is occupied by crystalline phyllites, and to the south by highly foliated calcareous schists. In this mountain mass there is a remarkably large corrie or cirque, the nearer rock-mounds of which consist of "Eisendolomit," a dolomite with a reddish weathered surface resting directly on the phyllites. The section to which Dr. Young directs more particular attention commences at the back of the corrie at an altitude of 2150 metres above sea-level, with a massive grey dolomite in which no stratification is discernible. This section from the floor of the corrie, called Grübl, to the summit of the Nederer peak, 2763 metres high, is composed of the following formations from above downwards: (1) green quartzite schists with red hæmatite schists; (2) band of dolomite freely penetrated by quartz veins, with dolomite breccia; (3) calcareous schists; (4) limestones; (5) massive dolomite. The breccias of the dolomite band penetrated by quartz veins (2) differ in many ways from those of the massive dolomite (1), and exhibit a peculiar relation to schist. In one spot, within a space of 3 feet, there are some eight or ten vertical plates of this dolomite breccia alternating with as many bands of schist which is foliated parallel with the plates. Fine quartz veins traverse the dolomite in all directions, but invariably stop short of the schist. The phenomenon cannot, of course, be due to a stratigraphical sequence, but must have resulted from the splitting up of the dolomite into parallel-walled plates between which the schist was injected. Later dynamical and chemical processes may have caused the foliation of the schist without materially altering the structure of the dolomite. A little to the south of the corrie, in the upper Tarntal, is the huge mass of the Reckner Serpentine, 260 metres in depth, the intrusive character of the serpentine being well seen at several contacts with the schist. The physiography of the Tarntal mass is also interesting. The cirque or corrie seems to have owed its existence to ice-erosion, whereby the massive dolomite was scooped out down to the present floor of schists. The snow-line of this small mass is well below the summits, but there is not much level surface capable of retaining the snow. The upper and lower Tarntal valleys contain several small lakes or ponds which often bear ice till midsummer, an indication of their proximity to the snow-line.

ASIA.

The Mergui and Moskos Islands Pearl Fisheries.—Messrs. R. N. Rudmose Brown, B.Sc., and J. J. Simpson, M.A., B.Sc., have submitted to the Government of Burma a joint report on these fisheries, with recommendations for their improvement and extension. It appears that systematic pearling in the Mergui archipelago dates only from 1891, and for convenience of administration the grounds were divided into five blocks, the entire group of banks lying between 12° 40′ and 10° 0′ N. lat. The only two settlements of any importance are Mergui in the north and Point Victoria in the south, Tavoi in the extreme north being rather inaccessible, lying as it does 35 miles up a tortuous river and remote from Mergui, where all the pearling is done. The writers of the report point out that the outer and southerly islands are promising localities and ought to be carefully examined, and if banks of any extent were discovered, Point Victoria might become an important centre of the pearl trade. Again, around the Moskos islands and at the mouth of the Tavoi river there is an extensive unworked area of pearling ground. Formerly a little pearling was done here, but there is no demand for licences now, though much might be done if the licence fee were reduced and the jurisdiction over the banks were transferred to Mergui, as they are within easier reach of that town. The authors of the report submit a detailed list of these banks, which they pronounce, after due inspection, to be "exceedingly valuable beds, better than most in the archipelago." They add that "it would be unfortunate to allow these to remain unworked, a state of affairs which will certainly continue to be the case under the existing regulations." The Mergui fisheries in the past have proved more remunerative for individuals than they are to-day, but they still bring a large measure of its prosperity to Mergui and no small profit to the owners, while, taking all aspects of the pearl fisheries into consideration, they constitute a valuable asset to the Government of Lower Burma. The season extends from September or October to April or May. During that period diving is carried on only at neap-tides, so that the working days of each month vary from ten to fifteen, the whole working year consisting of about seventy days. The divers are of several nationalities, viz. Japanese, Philippino, Malay, Chinese, and Burmese. Of these the Japanese are the best in respect of the depths to which they descend, and are, consequently, best paid. The most expert among them, who say they can descend to 29 and occasionally 30 fathoms, can practically dictate their own terms. These divers are, however, very reckless, and their rate of mortality is high. The Philippino divers are in the majority, and, though they will seldom descend to more than 28 fathoms, are more reliable, for they exercise a caution and exhibit a capability of resistance, both of which are unknown to the Japanese divers. Many of them have been working in the Mergui waters for fourteen years, and exhibit a strange vitality under those trying conditions of life. Of the two oysters obtained by the divers, by far the more important is the "mother of pearl" shell (*Margaritifera maxima*), valuable on account of both its shell and the pearls it may contain. The shell of the other species (*Pteria macroptera*), commonly known as the arc or spoon shell, has no commercial value, and is collected merely for the sake of its pearls. The sales of pearl shell pay the working expenses, and in most cases permit of a margin of profit, but the real revenue of the owners is derived from the pearls, one or more of which, on an average, are found in every ten shells. The Mergui pearls are noted for their colour and lustre, and fetch high prices in the London and other markets; their average size is greater than others, and many attain quite a large size with exceptional brilliancy. It is a matter of extreme difficulty to ascertain even approximately the number or value of the pearls entering Mergui annually, owners being extremely

reticent on the subject. They may and do range in value from a few rupees to Rs.15,000 apiece, though pearls worth over Rs.5000 are rare. The most valuable pearls on record were two found in 1907 in a "blister" (a nacreous excrescence on the shell), which were worth Rs.50,000 (£3125).

Rainfall Observations in the Philippines.—Information upon this subject is given by Dr. W. Krebs in an article entitled "Die Niederschlagsverhaltnisse der Philippinen," published in the *Deutsche Rundschau für Geographie* (vol. **30**, No. 12). There are only sixty-four rain-stations, which is a small number for an archipelago consisting of 3121 very mountainous islands comprising a total land surface of 188,000 square kilometres; but the system of observations has made rapid progress under the direction of Spanish Jesuits in Manila. The series of rainfall observations extends back to forty-two years in Manila, but at ten only of the other stations, seven of which are in the island of Luzon, does the record go back farther than seven or more years. The average rainfall of the forty-two years at Manila is 192 cms. (74·6 inches) per annum. In the southern portion of the Philippine isles the eastern part gets more than 200 cms. (82·7 inches) of rain a year, and the western portion less, but, curiously enough, the north of the Philippine isles exhibits quite an opposite distribution of rainfall. This anomaly seems to be connected with the paths of typhoon disturbances, which especially control the precipitation of these islands. The average number of typhoons is 21 per annum. The heaviest precipitations recorded at the Manila observatory during the forty-two years of its existence, measuring a couple of inches or so in an hour, have come with thunderstorms associated with typhoons. In the middle of July, 1904, a rainstorm which inundated the south of the island of Luzon brought down at the Manila observatory 17 inches within twenty-seven hours. The flood cost 200 human lives, and caused a destruction of property estimated at eight or nine million marks.

AFRICA.

The Nile Flood of 1907.—Captain H. G. Lyons gives a full report of the rains of the Nile basin and the Nile flood in 1907 in paper No. 9 of the Survey Department of Egypt (Cairo, 1909). In 1906 the flood had shown an improvement upon those of the two preceding years, but in 1907 it was the lowest during the last fifty years or more, the volume of water which passed Wadi Halfa being only 0·60 of the volume of an average flood. The monsoon rains which fall in July and August over the Abyssinian tableland and run off into the Blue Nile—the main carrier of the Nile flood—were late in commencing, weak and ill sustained, and broken by periods of fine weather which checked the rise of the river-levels. Owing, however, to the improvements in the irrigation system and to the fact that exceptionally heavy rains fell upon the Abyssinian highlands in February, March, and April, thus raising the low-stage level of the Nile, the low flood of 1907 did not prove disastrous to Egyptian agriculture, and there was sufficient water available for the cotton crop in May, June, and July. These occasional spring rains of Abyssinia are thus of great economical importance, and are being actively investigated by meteorologists. An interesting phenomenon of the Nile system during the summer is the holding up of the waters of the White Nile by the flooding of the Blue Nile, whereby some 450 square kilometres of the White Nile valley are converted into a lake. As a result of the low flood in 1907, this ponding effect was but poorly pronounced in comparison with other years, being shown by the gauge records at Geteina and Dueim, but only very slightly at Hellet Abbas.

Northern Nigeria: Mineral Survey.—The preliminary mineralogical and geological survey of Northern Nigeria, which has been in progress during the last five years, has just been completed by Dr. J. D. Falconer, assisted first by Mr.

Douglas Home, F.R.G.S., and latterly by Mr. Arthur Longbottom, B.A. The work has been carried out under the general direction of Prof. Wyndham R. Dunstan, Director of the Imperial Institute, at whose suggestion the survey was instituted by the Colonial Office in 1904. Extensive deposits of tin-bearing alluvium have been discovered, especially in the central province, while gold, argentiferous galena, monazite, salt, and many ores of iron have been found in places throughout the Protectorate in greater or less abundance. The economic results of the survey are being published as Colonial Reports by Prof. Dunstan, while the purely scientific results will be published by Dr. Falconer in the course of the winter. Important information has been obtained as to the age and origin of Lake Chad, the Bauchi plateau, and the present river system. A geological map has also been compiled, which will go far towards filling the blank, at present so acutely felt, in our knowledge of the geological structure of the Central Sudan.

Researches in Mauritania.—Mauritania, the name adopted for the French territory on the West African coast north of the Senegal, has hitherto met with little attention from scientific travellers, partly no doubt owing to the unsettled state of the country, which has at last necessitated the despatch of a military expedition under Colonel Gouraud for the purpose of bringing the territory under more definite control.* Some useful additions to our knowledge were, however, made last year by an expedition carried out by MM. Gruvel and Chudeau (the latter well known for his geological work in the Central Sahara), who have lately outlined the results of their researches in *La Géographie* (July, 1909), the former dealing with the geography, the latter with the geology, botany, ethnology, etc. The route of the travellers led north from St. Louis, never diverging to any great extent from the coast, so that it is to the littoral tract that their description, so far as it is based on personal observation, applies. Northwards their examination extended a little beyond Cape Blanco, almost to the Spanish frontier. In spite of the ancient relations of the Dutch and other European nations with this coast, parts of it have remained very imperfectly known, and the travellers have been able to make considerable rectifications of existing maps. The prominent Cape usually designated Mirik is known to the natives as Timiris, of which the former name seems to be a corruption. North of this, the islands and sandbanks which have been shown near Cape Yuik have no existence, but just north of 20° there is a group of islands known as Ikniva, which have not hitherto found a place in the maps. They are composed of masses of greenish sandstone similar to that which forms a series of plateaus along the mainland. Geologically, the region consists of a littoral belt of horizontal Tertiary and Quaternary formations, passing inland into crystalline rocks, rising to a maximum elevation of some 1800 feet. The recent formations consist chiefly of sands and clays, the latter occurring in the sebkhas, or low-lying flats, remnants of old salt lakes. Among the deposits of marine molluscs, those of *Senilia senilis* play an important part. The shells are remarkably heavy (they are used as ballast on the Dakar–Saint Louis Railway), and in places cover the surface as with solid rock. These deposits point to the former existence of an arm of the sea stretching inland at least as far as Tagant, and M. Chudeau hazards the suggestion that it may even have reached as far as the neighbourhood of Timbuktu, where deposits of recent marine shells have also been found. One of the sebkhas, about 50 miles north of the Senegal, is exploited by the Moors, the salt being transported considerable distances. Climatically, the Mauritanian coast may be divided at Cape Timiris into two distinct regions. To the south, winter rains occur

* Some account of the history of French dealings with the territory and of its present condition appeared in the *Revue Française* for February, 1909, with map.

regularly, though insufficient to permit the regular cultivation of crops. To the north is the desert, in which only occasional storms occur. This difference makes itself felt in the character both of the vegetation and of the dunes, both of which M. Chudeau describes in some detail. Apart from the westerly winds on the actual coast, those from the north seem to predominate, carrying the sand southwards, and displacing the estuaries in the same direction. The population of the region is very mixed. Besides the Zenaga, who form the basis and speak a Berber tongue, and Moors descended from those of Spain, there are traces of old indigenous peoples, such as the half-sedentary Imragen, who live entirely by fishing. These people inhabit the village of El Mamghar, a little south of Cape Timiris, which is the centre of a considerable trade in dried fish.

African Ideas on Earthquakes is the title of a paper by B. Struck, originally published in *Globus*, a translation of which has appeared in the *Journal of the African Society* (vol. 8, No. 32). To the Negro, as to primitive man in general, earthquakes are manifestations of animistic subterranean agencies. Of the two souls of man, *okra* proceeds before birth from and returns after death to God. The other soul, *mulimo*, formed during life, becomes, in the case of death by violence, a spectre haunting the vicinity of the grave. In the case of a natural death it vanishes in the under-world, and, more particularly if the soul of a chief, may cause earthquakes. In 1873, *e.g.*, on the death of the Great Munza, a severe shock was felt in the Mangbettu country. Among the Washambla an earthquake arises on the closing of an iron door after admission of a chief's spirit. When in 1854 a severe shock occurred in the Bakwena country, Sechele, otherwise an enlightened man, requested J. Chapman to send him word, on his return home, of the great man who had died. The Accra earthquake of 1862 was attributed by the King of Dahome to the dissatisfaction of his father's spirit with the ceremonies at his funeral. Such is the earth-shaking power of chiefs that Kalamba Mukenge, the Bena Lulua chief, was known as "the Shaker." In the Konde country the frequent light shocks are caused by Kyara holding a review of souls underground; severe shocks are "tokens of our father's anger in the under-world." Shocks in the Kilimanjaro district are due to the tread of spirits hastening to their chief, or, according to the Masai interpretation, the march of a host of warriors in the spirit-world. Localized and developing distinct attributes, *milimo* (plural of *mulimo*) become "demons of the depths" in contradistinction to "demons of the height." In Nkole earthquakes are the work of the she-devil Nyabingi. In Uganda an earthquake is caused by the walking of the son of Mugasa on a rock in Lake Victoria, on which the Earth rests. The article includes interpretations of earthquakes in Christian Abyssinia, etc.

AMERICA.

The Yakutat Coastal Plain of Alaska.—In the *American Journal of Science* for June, 1909, Mr. Eliot Blackwelder considers the nature and mode of formation of the Yakutat coastal plain of Alaska. This plain is narrow, and fringes the southern coast of Alaska from the mouth of the Alsek river to Controller bay, and from Yakutat bay westward it is partly covered by the Malaspina Piedmont glacier. Towards the ocean the plain dips beneath the water-level, leaving a fairly uniform shore-line; and on the north it is bounded by the Brabazon range of mountains, the front of which rises abruptly some 3000 feet without either foothills or fringing talus slopes. The climate is, of course, cold and raw in winter, cool and moist in summer, and the atmosphere is almost permanently soggy. In summer the warm winds from the Pacific keep the mountains shrouded in mist and rain for days together, with only occasional sunny intervals, whilst in winter

the snowfall is great, and streams and soil become frozen. This kind of climate is favourable to a dense growth of vegetation over the plain. On the flat, undrained parts grassy marshes and willow swamps prevail; but on moraines, sandy ridges, and all better-drained situations, there are dense spruce forests, with a dank undergrowth of mosses, ferns, and "devil's-club." The rivers are full and permanent, although subject to fluctuations with the rainfall; all of them except the Alsek are short streams, some of them rising in the glaciers which choke the mountain valleys. The glacial rivers are small and milky, due to fine sediment, but the others, drawing their water through swamps and lakes, are clear. The glacial streams are of more importance than the others in the history of the plain. The rivers which cross the plain are always changing their course, and are engaged in aggrading. They have no valleys, and their immediate channels are only sunk a few feet beneath the plain, which seems to have been built out into the ocean by these aggrading rivers. Owing to the rivers being swiftest near the mountains, the sediments are graded in coarseness. Thus near the mountains coarse gravel predominates, but seaward this passes into sand, and finally silt. The sediments are black and grey, with tinges of green, and are found to consist of particles of slate, greenstone, quartz, felspar, and ferro-magnesian minerals, with a varying admixture of carbonaceous material. It is an interesting fact that these sediments are analogous in many respects to the hard rocks of the Brabazon mountains behind them, which are also composed of the Yakutat series belonging to the Carboniferous and Jurassic systems.

AUSTRALASIA AND PACIFIC ISLANDS.

The British Expedition to Western New Guinea.—We are informed that the organization of this expedition, which, as already stated in the *Journal* (vol. 33, p. 93), is to be under the command of Mr. Walter Goodfellow, is in an advanced state, and it will, according to present arrangements, leave this country on October 22, travelling *viâ* Colombo to Singapore, and thence by Dutch boat to the Aru islands, the party then proceeding by schooner to a point on the coast of New Guinea north-north-east from that group. It is expected that the landing will be made early in January. Among the naturalists taking part in the expedition are Dr. A. F. R. Wollaston (who, it will be remembered, took part in the British Museum Expedition to Ruwenzori in 1906), Mr. W. Stalker, and Mr. G. C. Shortridge; while, as mentioned in the July number (p. 91), Captain Rawling has been appointed surveyor to the expedition, the funds of which are supported by a grant from our Society. He will be assisted by Dr. Eric Marshall, a member of Mr. Shackleton's recent Antarctic expedition. Among other surveys, it is hoped to do something towards a more accurate delineation of the coast-line of south-western New Guinea than appears in existing charts. Mr. Stalker, who has already started for the East, is collecting carriers for the expedition from one of the South Sea islands.

The Kaiserin Augusta River, German New Guinea.—This great river, the importance of which was first brought to light by the expeditions of Captain Dallmann, Governor von Schleinitz, Dr. Schrader, and others, in the years 1886 and 1887, has since the latter year been almost entirely neglected by explorers, and only quite recently have any further steps been taken to investigate the capabilities of the region through which it flows. In November, 1908, an ascent of the river for some 200 miles from its mouth was made by Herr Full, an official of German New Guinea, extracts from whose report appear in the *Deutsches Kolonialblatt* for August 1 of the present year. The writer gives an interesting account of the river itself and the country through which it flows, in the parts of its course visited by him. The mouth is not obstructed by a bar, and has a width of nearly a mile, while it maintains a width of 300 to 450 yards as far as the

highest point reached. Its banks are well marked, and only for a short stretch about 40 miles from the coast does it form a lake-like expansion with islands. The lowest part of its course leads, however, through a region of lagoons and sago-swamps, and side channels are said to supply a connection with the mouth of the Ramu. Nowhere was the channel obstructed by sandbanks or accumulations of driftwood, while throughout the section examined the deepest channel maintained a depth of at least 50 feet, soundings being taken every ten minutes. The tropical swamp vegetation at its mouth gave place, about 40 miles up, to a small extent of forest, and this in turn to a park-like landscape passing into a tree savannah. This wide alluvial plain was broken here and there by wooded hills, while the position of villages was marked by plantations of bread-fruit trees and groups of coco-nut palms. The natives showed no hostile disposition, but beyond about 55 miles from the river's mouth they spoke a language unknown to the interpreters. Their houses are among the most imposing in the whole of German New Guinea, although the use of iron is practically unknown, and the art of the people showed little trace of outside influence. They navigate the stream in canoes made of a single tree, capable of holding fifteen men. They cultivate tobacco both for their own use and for purposes of trade. The writer discusses the economic possibilities of the region, pointing out that the river supplies the natural means of access to the western interior of the German territory, and that its fertile lowlands are eminently adapted for the cultivation of tobacco and other tropical products. Climatic conditions are not, however, favourable to settlement, and in any case the development of the region is likely to proceed but slowly.

POLAR REGIONS.

Rasmussen's proposed New Expedition to Arctic America.—We mentioned (*Journal*, vol. **22**, p. 535) that this explorer had for some time had in view a more extended expedition for the study of the Eskimo of Arctic America than any yet undertaken by him. From information recently received, it appears that Mr. Rasmussen, who during the past summer has been in Greenland under a commission from the Danish Government, proposes to start, in 1910 or 1911, on a three years' tour in dog-sledges through the American Arctic archipelago, approximately by the route followed by Amundsen in the *Gjöa*, ultimately extending his anthropological researches as far as Alaska. He hopes to be accompanied by a few scientific men, but the final arrangements have not yet been made.

The Eskimo of East Greenland.—An interesting summary of our knowledge respecting the former Eskimo settlements on the East Greenland coast is given by Captain G. Amdrup, leader of the "Carlsberg fund" expedition of 1898–1900, in the *Meddelelser om Grönland*, vol. **28**. The writer begins by recounting the various expeditions, from that of the Dane P. O. Wallöe in 1751–52 to those of quite recent date, which have contributed to the solution of the question, showing that while no living Eskimo has been found along the stretch of coast from Scoresby sound northward since Clavering's journey in 1823, on the eastern part of the east coast the results have been different, a scattered Eskimo population having been found by Graah (1828–31) all along the east coast to 65° 15′ N., while in 1883–85 a numerous tribe was found in the Angmagsalik district by Captain Holm, the explorer who has done more than any other to enlarge our knowledge of the East Greenland Eskimo. Amdrup's own expedition, undertaken with a view to searching for Eskimo settlements along the unexplored tract between 66° and Scoresby sound, proved that no living Eskimo were to be found along the whole stretch of coast, though abundant remains of former settlements were discovered, as by other explorers in the district further north. The paper above

alluded to contains a full description of these remains, which include houses (some in good preservation, with all the household utensils remaining *in situ*), tent encampments, graves, etc. The concentration of the existing population in the Angmagsalik district is to be explained by the particularly favourable conditions presented to the Eskimo in their struggle for existence by that part of the coast. The location of the settlements along the whole coast has been evidently determined by the orographic nature of its several parts. In the Angmagsalik district there is the largest group of islands on the whole east coast, forming numerous straits and sounds, kept clear of ice to a great extent by the currents which flow through them, thus affording natural resorts for seals. Wherever similar districts are found there are numerous proofs of a former Eskimo habitation, but these become scantier in proportion as the resemblance is less marked.

GENERAL.

Geography in Education.—The large amount of discussion which has been held as to the scope and methods of geography, especially from the point of view of education, has left us still so far from a general consensus of opinion on the subject that attention may be called to some judicious remarks by Mr. C. F. Marbut in the *Journal of Geography* for May last. The writer has a clear conception of the way in which geography should be taken up so as to subserve the purposes of education, and he traces the successive steps by which the subject may be developed in the school and college curricula. Notice may be directed in particular to the views expressed by the writer in regard to two or three matters on which opinion is not always equally sound. In the first place, he rightly condemns the tendency sometimes shown to theorize before the necessary facts are available—in other words, to adopt deductive rather than inductive methods in geographical study; and in the second, he makes a timely protest against the attempt to use geography merely as a vehicle for imparting a smattering of general elementary science. He is likewise not afraid to widen the scope and enhance the value of the subject by making use of the facts and phenomena derived from other sciences. "Many geographical facts," he says, "are facts of botany, of physics, chemistry, astronomy, and of zoology, as well as of economics, history, and sociology. What, then, is the difference? Is physical geography merely some artificial collection made from the realms of other sciences? Far from it; these facts and phenomena are as much a part of geography when they are geographically treated as they are of botany, or any other science, when treated from the several points of view of those sciences. They are geographically treated when they are considered from the points of view of distribution and of relation to each other."

OBITUARY.

Dr. Georg von Neumayer.

By Hugh Robert Mill, D.Sc.

Amongst the honorary corresponding members of the Society there can be few who have appealed so strongly, not only to the respect, but to the affection of a great circle of friends in all lands as his Excellency, Geheimrat Prof. Dr. George von Neumayer, whose death on May 24 has caused heartfelt sorrow amongst the geographers of the world. Dr. von Neumayer lives in our memory as a singularly gracious old man whose beautiful features were always lighted by a majestic benignity

which spoke of a noble and generous heart. His courtly manners belonged to an earlier generation, and recalled the fact that he was a contemporary of Humboldt, whose friendship secured for him an introduction to the science which he pursued. In Hamburg, where he passed thirty years of his life, Dr. von Neumayer was held in the highest esteem, and at the meetings of the Deutsche Geographentag, of which he had been the President for many years, and of the German Meteorological Society he was looked up to with loving reverence. Dr. von Neumayer spent his last years peacefully in the place of his birth, Neustadt-am-Haardt, in the Bavarian palatinate. Here he lived next door to his aged sister, whose recent death affected him profoundly, and was probably the means of shortening his own life by lessening his power of resisting an attack of influenza from which he did not recover.

In early life Dr. Neumayer was fascinated by the Antarctic voyages of the great period of South Polar exploration 1837–43, and this prepared him for falling under the spell of Maury's treatise on the Physical Geography of the Sea. He followed the sea less as a profession than as an opportunity for studying oceanography and magnetism; he tried in vain to enter the Austrian navy at the time when Austria was the dominant German state, and in the early fifties of last century he spent two years as a gold-digger in Australia when the gold-fever was at its height. From this experience he returned to Europe on fire with the desire to get up an Antarctic expedition. In his last book, 'Auf zum Südpol,'* he traces, in a brilliant chapter of autobiography, the working of this great wish throughout his life. He was always willing to assist the promotion of Antarctic research, as is attested by his memorable paper at the Sixth International Geographical Congress in 1895, and still more by his co-operation in the great meeting at the Royal Society on February 24, 1898, which led to the expedition of the *Discovery*. He lived long enough to hear of the successful return of the *Nimrod* expedition from 88° S. But his early ambition to take a personal part in polar research was never gratified.

He returned to Australia in 1856 with a subsidy from the King of Bavaria to study the magnetism of Victoria, and he established the Flagstaff Observatory at Melbourne for that purpose. The magnetical and meteorological results were published in a series of volumes in English printed in Melbourne in 1860 and 1864, and at Mannheim, after his return to Germany, in 1867 and 1869. While living in Melbourne, he took an active part in promoting the exploration of the interior of Australia, and, in particular, the search for the lost explorer Leichardt, whose letters he subsequently edited.

The great work of his life lay in directing the Deutsche Seewarte, the German Naval Observatory, over which he presided from its foundation in 1876 until he retired at the age of seventy-seven in 1903. He founded and edited the *Annalen der Hydrographie und maritimen Meteorologie*, and in the early years of the German Empire strove hard to inculcate a spirit of maritime enterprise, always keeping to the front the importance of scientific observations, and the improvement of charts and sailing directions. Though not himself writing much on oceanography, Dr. von Neumayer had a great influence in moulding the careers of his students and assistants, and to his fatherly oversight may be traced much of the valuable work of Prof. Otto Krümmel of Kiel and of Prof. Gerhard Schott of Hamburg.

Dr. Neumayer took a leading part in securing the international agreement for circumpolar meteorological and magnetic observations in 1882–3, best remembered for the work of the American party under Lieut. Greely at Fort Conger, but scarcely less important for the French work in Tierra del Fuego and the German on South Georgia for the Antarctic, and at Kingaina fjord on Cumberland gulf for the Arctic

* For detailed notice see *Geo. Journ.*, **19** (1902), pp. 362–364.

regions. He presided over the International Polar Conference in Hamburg in 1879, at which the plans for co-operation were elaborated, and he subsequently edited the two volumes of German results.

He also prepared the section on Terrestrial Magnetism in Berghaus's Physical Atlas, and in collaboration with others produced many important meteorological memoirs. While the number of scientific papers which stand in Dr. von Neumayer's name is very large, and the mass of administrative work which he got through in organizing and directing all departments of the Naval Observatory at Hamburg was very great, his greatest claim on the gratitude of the present generation is probably to be based on the immense personal influence he exercised on those with whom he came in contact, and the great strides of the science of oceanography in Germany during recent years are very largely due to the effect of his teaching and example.

CORRESPONDENCE.

Cloud-caps on Snowy Peaks.

It would be interesting to know if the cloud-phenomenon which is depicted on the accompanying sketches has been seen by other observers in mountain regions. The cloud-cap takes the form of a flat crescent, its concave side almost resting upon the top of the peak. Fig. 1 is taken from a photo of Mount Rainier, just

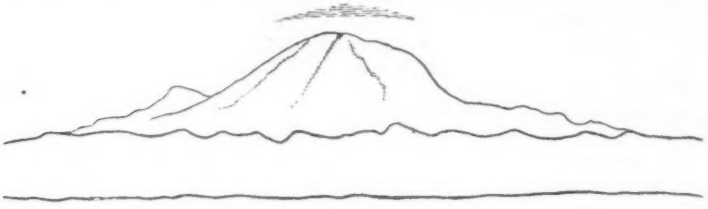

Fig. 1

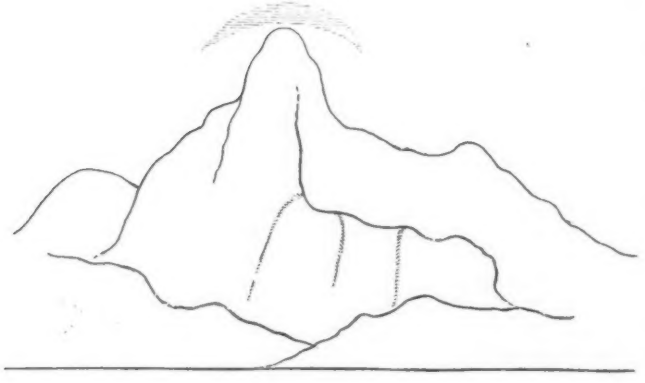

Fig. 2

received, the beautiful peak of the Cascades in Washington (14,440 feet altitude). Fig. 2 is an exact sketch taken by myself in the Andes of Peru, and the height of the peak is about 18,000 feet. Both these peaks are covered with perpetual snow. I have noted the same cloud-formation on other peaks in Peru and Bolivia. Is it only a coincidence, or does it obey some special cause? It will be observed that the form of the crescent apparently obeys the form of the peak, and it seems reasonable to suppose it connected with the evaporation of snow-moisture.

C. Reginald Enock.

September, 1909.

GEOGRAPHICAL LITERATURE OF THE MONTH.

Additions to the Library.

By EDWARD HEAWOOD, M.A., *Librarian*, R.G.S.

The following abbreviations of nouns and the adjectives derived from them are employed to indicate the source of articles from other publications. Geographical names are as a rule written in full:—

A. = Academy, Academie, Akademie.
Abh. = Abhandlungen.
Ann. = Annals, Annales, Annalen.
B. = Bulletin, Bollettino, Boletim.
Col. = Colonies.
Com. = Commerce.
C.R. = Comptes Rendus.
E. = Erdkunde.
G. = Geography, Géographie, Geografia.
Ges. = Gesellschaft.
I. = Institute, Institution.
Iz. = Izvestiya.
J. = Journal.
Jb. = Jahrbuch.
k.k. = kaiserlich und königlich.
M. = Mitteilungen.
Mag. = Magazine.
Mem. (Mém.) = Memoirs, Mémoires.
Met. (mét.) = Meteorological.
P. = Proceedings.
R. = Royal.
Rev. (Riv.) = Review, Revue, Rivista.
S. = Society, Société, Selskab.
Sc. = Science(s).
Sitzb. = Sitzungsbericht.
T. = Transactions.
Ts. = Tijdschrift, Tidskrift.
V. = Verein.
Verh. = Verhandlungen.
W. = Wissenschaft, and compounds
Z. = Zeitschrift.
Zap. = Zapiski.

On account of the ambiguity of the words *octavo*, *quarto*, etc., the size of books in the list below is denoted by the length and breadth of the cover in inches to the nearest half inch. The size of the *Journal* is 10 × 6½.

A selection of the works in this list will be noticed elsewhere in the "Journal."

EUROPE.

Alps. **Whymper.**

Chamonix and the range of Mont Blanc. A guide by Edward Whymper. 14th edit. (pp. xiv. and 206). The valley of Zermatt and the Matterhorn. By the same. 13th edit. (pp. xiv. and 224). London: J. Murray, 1909. Size 7½ × 5. *Maps and Illustrations. Price (each) 3s. net. Two copies, presented by the Author and Publisher.*

Austria-Hungary. **Drage**

Austria-Hungary. By Geoffrey Drage. London: J. Murray, 1909. Size 9 × 6, pp. xx. and 846. *Maps. Price 21s. net. Presented by the Publisher.*

France—Colonies. **Ware.**

Étude sur la section coloniale de l'Exposition Franco-Britannique de Londres en 1908. Par Lewis Ware. Paris: Dépêche Coloniale, 1909. Size 9½ × 6½, pp. 430. *Presented by the Author.*

France—Marne. **Joanne.**

Collection des Guides-Joanne. Reims. Paris: Hachette & Cie., 1909. Size 6 × 4, pp. 40. *Plans and Illustrations. Price 1 fr. Presented by the Publishers.*

France—Seine-Inférieure. **Joanne.**

Collection des Guides-Joanne. Rouen et ses environs. Paris: Hachette & Cie., 1909. Size 6 × 4, pp. 60. *Plans and Illustrations. Price* 1 *fr. Presented by the Publishers.*

France—South. **Joanne.**

Collection des guides Joanne: Marseille et ses environs (pp. 56); Saint Raphaël et l'Estérel (pp. 62). Paris: Hachette & Cie., 1909. Size 6 × 4. *Plans and Illustrations. Price (each)* 1 *fr. Presented by the Publishers.*

France—Tarn. **Joanne.**

Géographie du département du Tarn. Par Paul Joanne. 6e édition. Paris: Hachette & Cie., 1909. Size 7 × 4½, pp. 64. *Map and Illustrations. Price* 1 *fr. Presented by the Publishers.*

Germany—Bavaria. **Götz.**

Frankenland: Ober-, Mittel-, und Unterfranken. Von Wilhelm Götz. (Land und Leute: Monographien zur Erdkunde . . . herausgegeben von A. Scobel, 23.) Bielefeld, etc.: Velhagen & Klasing, 1909. Size 10 × 7, pp. 188. *Map and Illustrations. Price* 4*m.*

Germany—Berlin. *Z. Ges. E. Berlin* (1908): 539–548. **Baschin.**

Die klimatischen Verhältnisse der Stadt Berlin. Von Otto Baschin.

Germany—Brandenburg. **Jung.**

Beiträge zur Siedlungskunde der Zauche und des Nuthe-Nieplitz-Gebietes. Inauguraldissertation . . . von Hans Jung. Halle-a.-S., 1909. Size 9 × 6, pp. vi. and 92. *Maps. Presented by the Author.*

Germany—Meteorology. **Arendt.**

Abh. K. Preuss. Met. I. **2** (1908): No. 2, pp. 60 and 152.

Ergebnisse zehnjähriger Gewitterbeobachtungen in Nord- und Mitteldeutschland. Von Th. Arendt. *Sketch-maps and Diagrams.*

Germany—Northern Lowland. **Wahnschaffe.**

Die Oberflächengestaltung des norddeutschen Flachlandes. Auf geologischer Grundlage dargestellt von Prof. Dr. Felix Wahnschaffe. Dritte . . . Auflage. (Zugleich dritte Auflage von 'Forschungen zur deutschen Landes- und Volkskunde,' Bd. vi., heft i.) Stuttgart: J. Engelhorn, 1909. Size 9 × 6, pp. viii. and 406. *Maps, Sections, and Illustrations. Price* 10*m.*

This important work has been revised and extended in the present edition.

Germany—Prussia. **Reissert.**

Das Weserbergland und der Teutoburger Wald. Von O. Reissert. (Land und Leute: Monographien zur Erdkunde . . . herausgegeben von A. Scobel, 24.) Bielefeld, etc.: Velhagen & Klasing, 1909. Size 10 × 7, pp. 132. *Map and Illustrations. Price* 3*m.*

Greece—Delphi. **Poulsen.**

Oversigt K. Danske Videnskabs-S. Forhandl. (1908): 331–425.

Recherches sur quelques questions relatives à la topographie de Delphes. Par Frederik Poulsen. *Plans and Illustrations.*

Iceland. **Küchler.**

Wüstenritte und Vulkanbesteigungen auf Island. Von Karl Küchler. Altenburg: S. Geibel, 1909. Size 8 × 5½, pp. xvi. and 320. *Sketch-map and Illustrations. Price* 6*m. Presented by the Publisher.*

Ireland—Mayo. *Sci. P.R. Dublin S.* **11** (1908): 325–327. **Gordon and Dixon.**

Deposits of Unbroken Marine Shells at High Levels in the Carraun Peninsula, County Mayo. By T. E. Gordon and A. F. Dixon. *Sketch.*

Italy—Earthquakes. **Carrère.**

Jean Carrère. La terre tremblante: Calabre et Messine, 1907–1908–1909. Paris: Plon-Nourrit et Cie., 1909. Size 7½ × 5, pp. 342. *Price* 3 *fr.* 50. *Presented by the Publishers.*

Italy—Etna. **Platania.**

Sull' eruzione dell' Etna del 29 Aprile 1908. Prima relazione. Di Gaetano Platania. (Estratto dalle *Memorie della Classe di Scienze della R. Accademia degli Zelanti*, 3ª serie, vol. 5, 1905–06.) Acireale, 1908. Size 9 × 6½, pp. 89–96.

Italy—Gravity. *Ann. Idrografici* **5** (1908): 13–37. **Alessio and Abetti.**

Determinazione della gravità relativa fra Venezia e Padova, eseguita dal Dott. Alberto Alessio. Durate di oscillazione a Padova dei pendoli dell' apparato tripendolare Sterneck-Stückrath (R.I.I.). Dal Dott. Giorgio Abetti.

Italy—Seismology. **Platania.**

Gaetano Platania. Il terremoto calabrese dell' 8 Settembre 1905 a Stromboli. (Estratto dalle *Memoire della Classe di Scienze della R. Accademia degli Zelanti*, 3ª serie, vol. **5.**) Acireale, 1908. Size 9 × 6½, pp. 79–87.

Italy—Sicily—Earthquake. *Tour du monde* **15** (1909): 181–192. **Albay.**

Aux villes dévastées du Détroit de Messine. Par Jacques Tournadour d'Albay. *Sketch-map and Illustrations.*

Italy—Sicily—Earthquake. **Telles.**

O terremoto de Messina e Regio. Por Silva Telles. Lisbon, 1909. Size 10 × 6½, pp. 24.

Italy—Vesuvius. *Sci. T.R. Dublin S.* Ser. II. **9** (1909): 139–200. **Johnston-Lavis.**

The Eruption of Vesuvius in April, 1906. By H. J. Johnston-Lavis. *Maps, Sections, and Illustrations.*

Norway—Climate. **Rekstad.**

Forhandlingar Videnskabs-S. Christiania 1907 (1908): No. 7, pp. 8.

Die Abhängigkeit der Lage der Schneegrenze von den Sommerisothermen in Norwegen. Von J. Rekstad.

See note in the August number, p. 210.

Norway—Coast. *Rev. Maritime* **177** (1908): 569–594. **Vallaux.**

Campagne du "Bougainville" sur les côtes de Norwège en 1907. Par M. Camille Vallaux. *Sketch-maps and Sections.*

Concerned chiefly with the morphology of the south-west coast of Norway.

Portugal. **Koebel.**

Portugal: its land and people. By W. H. Koebel. London: A. Constable & Co., 1909. Size 9½ × 6½, pp. xvi. and 406. *Illustrations. Price* **16***s. net. Presented by the Publishers.*

Pyrenees. **Belloc.**

The Pyrenees. By H. Belloc. London: Methuen & Co., [1909]. Size 9 × 5½, pp. xii. and 340. *Sketch-maps and Illustrations. Price* **7***s.* **6***d. net.*

An excellent description of the Pyrenees by a writer possessed of true geographical insight.

Rhine Valley. *Z. Gletscherkunde* **3** (1909): 214–219. **Hug.**

Die Zweiteilung der Niederterrasse im Rheintal zwischen Schaffhausen und Basel. Von Dr. Jak. Hug.

Russia—Phytogeography. *Acta S. Sc. Fennicæ* **33** (1908): No. 6, pp. 56. **Cajander.**

Beiträge zur Kenntnis der Vegetation der Alluvionen des nördlichen Eurasiens. Von A. K. Cajander. II. Die Alluvionen des Onega-Thales. *Map and Sections.*

Russia—Siberia. *B.A. Imp. Sc. St. Petersbourg* (1909): 437–458. **Vollosovich.**

Excavation du mammouth de Sanga-Jurach. Par K. Vollosovič. *Illustrations.*

Scandinavia. **Baedeker.**

Norway, Sweden, and Denmark; with excursions to Iceland and Spitzbergen. Handbook for travellers by Karl Baedeker. 9th edition. Leipzig (London: T. Fisher Unwin), 1909. Size 6½ × 4, pp. lx., 468, and 38. *Maps, Plans, and Illustrations. Price* **8***s. Presented by the Editor.*

Sweden—Lappland. **Parmentier.**

Conférence sur le chemin de fer translapon. La Laponie économique et pittoresque. Par Georges Parmentier. (Extrait du *Bulletin de la Société Normande de Géographie*, 2e Cahier, de 1908, pp. 61–85.) Rouen, 1908. Size 10½ × 8, pp. 28. *Sketch-maps.*

Sweden—Norrland. *G.Z.* **15** (1909): 28–50. **Sieger.**

Norrland. Nach A. G. Högbom, von R. Sieger.

Switzerland. **Baedeker.**

Switzerland and the adjacent portions of Italy, Savoy, and Tyrol. Handbook for

travellers by Karl Baedeker. 23rd edition. Leipzig (London: T. Fisher Unwin), 1909. Size 6½ × 4, pp. xl. and 584. *Maps, Plans, and Illustrations. Price 8s. Presented by the Editor.*

Switzerland—Geodesy. **Commission Géodesique Suisse.**

Association Géodésique Internationale. Travaux astronomiques et géodésiques éxecutés en Suisse. . . . publiés par la Commission Géodesique Suisse. Vol. 11. Mesure de la base géodésique du Tunnel du Simplon. Zürich, 1908. Size 12½ × 9½, pp. viii. and 124. *Illustrations and Diagrams.*

Switzerland—Hydrology. ———

Tableaux graphiques des observations hydrométriques suisses et des températures de l'air et des hauteurs pluviales pour l'année 1907. Publié par la Bureau hydrométrique fédéral. [In German and French.] Bern, 1908. Size 15 × 9½, 8 pp. and 48 tables.

Switzerland—Hydrology. ———

Table de récapitulation des principaux résultats des observations hydrometriques suisses pour l'année 1905. Travail exécuté par le Bureau hydrométrique fédéral. Bern, 1908. Size 15 × 10, pp. 72.

United Kingdom. **Wood.**

Normal Tutorial Series. A physical and economic geography of the British Isles. By C. A. Wood. London: The Normal Press, Ltd., [1909]. Size 7 × 4½, pp. 136. *Maps. Price 1s. 6d.*

United Kingdom—Durham. **Woolacott.**

On a case of Thrust and Crush-Brecciation in the Magnesian Limestone, County Durham. By David Woolacott. (From the *University of Durham Philosophical Society Memoirs*, No. 1.) Newcastle-upon-Tyne, 1909. Size 9½ × 7½, pp. 16. *Sketch-map, Sections, and Illustrations. Presented by the Author.*

United Kingdom—Durham. **Woolacott.**

The Physical Geography of Sunderland and District. By David Woolacott. (From the *Transactions of the Sunderland Antiquarian Society*, vol. 8, 1908.) Sunderland, 1908. Size 9 × 5½, pp. 75–78. *Presented by the Author.*

United Kingdom—Fens. **Yapp.**

Sketches of vegetation at home and abroad. IV.—Wicken Fen. By R. H. Yapp. (Reprinted from the *New Phytologist*, vol. 7, Nos. 2 and 3, [Cambridge], February and March, 1908.) Size 9½ × 6, pp. 61–81. *Sketch-map and Illustrations.*

United Kingdom—Forestry. *J.R. Statistical S.* **72** (1909): 40–54. **Somerville.**

Forestry in some of its Economic Aspects. By Prof. William Somerville.

United Kingdom—Ireland. **Wilkinson and others.**

Memoirs of the Geological Survey of Ireland. The Geology of the country around Londonderry. By S. B. Wilkinson, A. McHenry, J. R. Kilroe, and H. J. Seymour, Dublin (London: E. Stanford). 1908. Size 9½ × 6, pp. vii. and 106. *Sketch-map, Index-map, Sections, and Illustrations. Price 2s.*

United Kingdom—Ireland. **Praeger.**

A tourist's flora of the West of Ireland. By Robert Lloyd Praeger. Dublin: Hodges, Figgis & Co., 1909. Size 7½ × 5, pp. 244. *Maps and Illustrations. Price 3s. 6d. net. Presented by the Publishers.*

United Kingdom—Ireland—Historical. **Green.**

P.R. Irish A. **27**, Sec. C. (1909): 263–269.

Armada ships on the Kerry coast. By Rev. William Spotswood Green. *Sketch-map.*

Gives a translation of a Spanish document relating to Marcos de Aramburu. (Cf. paper by the same writer in the *Journal* for May, 1906.)

United Kingdom—Isle of Man. **Herbert.**

The Isle of Man. Described by Agnes Herbert. London: J. Lane, 1909. Size 9 × 5½, pp. xvi. and 274. *Map and Illustrations. Price 10s. 6d. net. Presented by the Publisher.*

United Kingdom—Kent. *Science Progress* **3** (1909): 379–409. **Burr.**

The South-Eastern Coalfield, its Discovery and Development. By Malcolm Burr. *Sketch-map and Section.*

United Kingdom—Meteorology. **Mellish.**

The Weather of 1908 at Hodsock Priory, Worksop. [By Henry Mellish.] Size 8½ × 5½, pp. 8. *Diagram.*

United Kingdom—Northumberland. **Woolacott.**

Note on a recently formed Conglomerate near St. Mary's Island, Northumberland. By David Woolacott. (Reprint from the *Transactions of the Natural History Society of Northumberland and Newcastle-upon-Tyne*, New Series, vol. 3, part 2.) Newcastle-upon-Tyne, 1908. Size 9 × 5½, pp. 4. *Illustration. Presented by the Author.*

United Kingdom—Phytogeography. **Smith.**

Synopsis of the British Basidiomycetes: a descriptive catalogue of the drawings and specimens in the Department of Botany, British Museum. By Worthington George Smith. London: British Museum, 1908. Size 8½ × 5½, pp. 532. *Illustrations. Price* 10*s. Presented by the British Museum (Natural History).*

United Kingdom—Scotland—Ross. **Kaye.**

The climate of Strathspeffer. By H. W. Kaye. London: S. Sonnenschein & Co., 1909. Size 7 × 5, pp. 64. *Price* 2*s.* 6*d. Presented by the Publishers.*

An analysis of the available meteorological data, with a view to determine the characteristics of the climate of Strathspeffer and its therapeutic value.

United Kingdom—Somerset. **Knight.**

Cambridge County Geographies (edited by F. H. H. Guillemard). Somerset. By Francis A. Knight; assisted by Louie M. (Knight) Dutton. Cambridge: University Press, 1909. Size 7½ × 5, pp. xii. and 192. *Maps and Illustrations Price* 1*s.* 6*d. Presented by the Publishers.*

United Kingdom—Yorkshire. **Price.**

Leeds and its neighbourhood: an illustration of English history. By A. C. Price. Oxford: Clarendon Press, 1909. Size 7½ × 5, pp. xxiv. and 328. *Sketch-maps, Plan, and Illustration. Price* 3*s.* 6*d. Presented by the Publishers.*

ASIA.

Chinese Empire. **Futterer, Andrée, and Holderer.**

Durch Asien: Erfahrungen, Forschungen und Sammlungen während der von Dr. Holderer unternommenen Reise. Band II.: Geologische Charakter-Bilder; 2 Teil. Auf Grund der von Dr. Futterer hinterlassenen . . . Materialen bearbeitet von Dr. K. Andrée. Berlin: D. Reimer, 1909. Size 11 × 7½, pp. xxxiv. and 294. *Map and Illustrations. Price* 26*m. Presented by the Publishers.*

Eastern Asia. **Semenoff.**

"Rasplata" (the reckoning). By Commander Wladimir Semenoff. His diary during the blockade of Port Arthur and the voyage of Admiral Rojestvensky's fleet. Translated by L. A. B. London: J. Murray, 1909. Size 8½ × 5½, pp. xvi. and 190. *Price* 10*s.* 6*d. net. Presented by the Publisher.*

Eastern Asia. **Slack.**

My tour in the Far East. By Captain Charles Slack. (Reprinted from the *Territorial Service Gazette*, August 26—October 28, 1908.) London, 1908. Size 10 × 7, pp. [22]. *Illustrations. Presented by the Author.*

The author visited Port Arthur and the battlefields of the Far East, and gives a good deal of practical information likely to be of use to intending travellers to that region.

French Indo-China—Cambodia. **Beylié.**

Les ruines d'Angkor. Par le Général L. de Beylié. Paris: E. Leroux, 1909. Size 11 × 8, pp. 32. *Plan and Illustrations. Presented by the Publisher.*

Himalaya. **Burrard and Hayden.**

A sketch of the geography and geology of the Himalaya mountains and Tibet. By Colonel S. G. Burrard and H. H. Hayden. Part iv. The geology of the Himalaya. Calcutta, 1908. Size 12 × 9½, pp. iv., 207–308, and vi. *Maps and Sections. Price* 2 *rupees. Presented by the Geological Survey of India.*

Indian Ocean—Galega Island. **Lionnet.**

Notes et remarques sur l'île d'Agaléga (or Galéga). Par J. G. Lionnet. (Typewritten sheets.) Size 11 × 9, 116 ll. *Map and Illustrations. Presented by the Author.*

Malay Archipelago. **Richings.**

Through the Malay Archipelago. By Emily Richings. London: H. J. Drane, Ltd., [1909]. Size 7½ × 5, pp. 252. *Price 6s. Presented by the Publishers.*

Persia—Language. **Hasan.**

Persian self-taught (in Roman characters), with English phonetic pronunciation. By Shayk Hasan. London: E. Marlborough & Co., 1909. Size 7½ × 5, pp. 96. *Illustration. Price 2s. 6d. Presented by the Publishers.*

Russia—Area. **Shokalsky.**

Congrès Alliance française et S.G. Marseille, 1906 (1908): 180–184.

La superficie de la Russie d'Asie et la méthode employée pour la mesurer. Par J. de Schokalsky.

Russia—Siberia. *Science* **29** (1909): 303–306. **Jochelson.**

The Riabouchinsky Expedition under the auspices of the Imperial Russian Geographical Society. Par Waldemar Jochelson.

See note in the June number, p. 719.

Russia—Siberia—Altai. *Deutsche Rundschau G.* **31** (1909): 7–23, 69–79. **Leder.**

Vom Changai nach dem Altai. Von Hans Leder. *Illustrations.*

Turkey—Asia Minor. **Gallois.**

Asia-Mineure et Syrie (sites et monuments). Par Eugène Gallois. Paris: E. Guilmoto, [*not dated*]. Size 8 × 5, pp. 246. *Presented by the Author.*

Turkey—Asia Minor. *Travel and Exploration* **1** (1909): 419–426. **Townshend.**

Over the Anti-Taurus from Adana. By Captain Arthur F. Townshend. *Sketch-map and Illustrations.*

Turkey—Hejaz Railway. *National G. Mag.* **20** (1909): 156–172. **Maunsell.**

One Thousand Miles of Railway built for Pilgrims and not for Dividends. By Colonel F. R. Maunsell. *Sketch-map and Illustrations.*

Turkey—Orography. *National G. Mag.* **20** (1909): 142–156. **Huntington.**

The mountains of the Euphrates. By Ellsworth Huntington. *Illustrations.*

AFRICA.

Abyssinia—Historical. **Beccari and Mendez.**

Rerum Æthiopicarum Scriptores Occidentales inediti a Sæculo xvi. ad xix., curante C. Beccari. Vols. **8** and **9**: Patriarchæ Alph. Mendez Expeditionis Æthiopicæ Liber I. et II. Rome: C. de Luigi, 1908–09. Size 10½ × 7½, pp. (vol. **8**) lx. and 410; (vol. **9**) 546. *Purchased.*

Former volumes of this series were reviewed in vol. **24**, p. 213; vol. **30**, p. 80.

Algeria and Tunis. **Joanne and others.**

Collection des Guides Joanne. Algérie et Tunisie, rédigé par G. Jacqueton, Aug. Bernard et S. Gsell. Paris: Hachette et Cie., 1909. Size 6½ × 4, pp. 28, lviii., and 446. *Maps and Plans. Price 12 fr. Presented by the Publishers.*

Belgian Congo. **Bertrand.**

Le Congo Belge; initiation à la colonisation nationale. Par J. Bertrand. Brussels: A. de Boeck, 1909. Size 9 × 6, pp. x. and 148. *Maps, Diagrams, and Illustrations. Price 2 fr. Presented by the Publisher.*

East Africa—French Colonies. **Gallois.**

L'Afrique orientale Française: Djibouti, les Comores, Madagascar, la Réunion, Ile Maurice (Anglaise), les Kerguelen. Par Eugène Gallois. Paris: [*Privately printed; not dated*]. Size 8 × 5, pp. 232. *Sketch-maps and Illustrations. Presented by the Author.*

Portuguese East Africa. **Vasse.**

Three years' sport in Mozambique. By William Vasse. Translated from the French . . . London: Sir I. Pitman & Sons, 1909. Size 9½ × 6½, pp. xiv. and 164. *Sketch-map and Illustrations. Price 8s. 6d. net. Presented by the Publishers.*

Rhodesia—Archæology. **Hall.**

Pre-historic Rhodesia: An examination of the historical, ethnological, and archæological evidences as to the origin and age of the rock mines and stone buildings, with a gazetteer of mediæval South-East Africa, 915 A.D. to 1760 A.D., and the countries of Monomotapa, Manica, Sabia, Quiteve, Sofala, and Mozambique. By

R. N. Hall. London: T. Fisher Unwin, 1909. Size 9 × 6, pp. xxviii. and 488. *Maps and Illustrations. Price* 12*s.* 6*d. net. Presented by the Publisher.*

Sahara. **Chudeau.**

Missions au Sahara. Par E.-F. Gautier et R. Chudeau. Tome II. Sahara soudanais. Par R. Chudeau. Paris: A. Colin, 1909. Size 9½ × 6½, pp. iv. and 326. *Maps, Sections, and Illustrations. Price* 15 *fr. Presented by the Publisher.*

Senegal. **De la Salle.**

Dr. d'Anfreville de la Salle. Notre vieux Sénégal: son histoire, son état actuel, ce qu'il peut devenir. Paris: A. Challamel, 1909. Size 10 × 6½, pp. 300. *Map and Illustrations. Price* 6*s.*

An up-to-date account of the Senegal colony and its resources.

Uganda. **Purvis.**

Through Uganda to Mount Elgon. By J. B. Purvis. London: T. Fisher Unwin, 1909. Size 8 × 5, pp. 372. *Sketch-map and Illustrations. Price* 6*s. net. Presented by the Publisher.*

NORTH AMERICA.

America—Historical. **Mulhall.**

Explorers in the New World before and after Columbus, and the story of the Jesuit Missions of Paraguay. By Marion McMurrough Mulhall. London: Longmans & Co., 1909. Size 7½ × 5, pp. xiv. and 314. *Portrait and facsimile maps. Price* 6*s.* 6*d. net. Presented by the Publishers.*

Canada—Historical. **Wood.**

The logs of the conquest of Canada. Edited . . . by Lieut.-Colonel William Wood. (*Publications of the Champlain Society*, vol. 4.) Toronto, 1909. Size 9½ × 6½, pp. xxvi. and 336. *Maps (facsimile, etc.). Purchased.*

Canada—Rockies. **Wilcox**

A guide-book to the Lake Louise region, including Paradise Valley, Valley of the Ten Peaks, and neighbourhood of Lake O'Hara. By William Dwight Wilcox. [Washington, D.C.] 1909. Size 9 × 6, pp. 54. *Map and Illustrations. Presented by the Author.*

Canada—Waterway. ——

Department of Public Works, Canada. Georgian Bay ship canal. Report upon survey, with plans and estimates of cost, 1908. Ottawa, 1909. Size 9½ × 6½, pp. xxii. and 602. *Maps, Sections, and Illustrations; also separate Album of Views, and* 3 *vols. of Maps and Diagrams. Presented by the Department of Public Works, Canada.*

Mexico. **Enock.**

Mexico: its ancient and modern civilization, history, and political conditions, topography and natural resources, industries and general development. By C. Reginald Enock. (The South American Series, edited by Martin Hume.) London: T. Fisher Unwin, 1909. Size 9 × 5½, pp. xxxvi. and 362. *Maps and Illustrations. Price* 10*s.* 6*d. net. Two copies, presented by the Author and Publisher.*

United States—Arizona. *U.S. Geol. Surv. B.* **352** (1908): pp. 96. **Lee and Johannsen.**

Geologic reconnaissance of a part of Western Arizona. By Willis J. Lee. With notes on the Igneous rocks of Western Arizona, by Albert Johannsen. *Sketch-maps, Diagrams, and Illustrations.*

United States—California. **Arnold and Anderson.**

U.S. Geol. Surv. B. **357** (1908): pp. 142.

Preliminary Report on the Coalinga Oil District. Fresno and King's Counties, California. By Ralph Arnold and Robert Anderson. *Index-map and Sketch-maps.*

United States—California. *U.S. Geol. Surv. B.* **353** (1908): pp. 128. **Diller.**

Geology of the Taylorsville Region, California. By J. S. Diller. *Maps, Plans, and Sections.*

United States—California—Salton Sea. **Newell.**

Smithsonian Rept. 1907 (1908): 331–345.

The Salton Sea. By F. A. Newell. *Map and Illustrations.*

A useful summary of the facts connected with the recent overflow of the Colorado into this basin, and of the measures to repair the breach.

United States—Colorado. **Young.**
P.A. Natural Sc. Philadelphia **60** (1908–09): 403–409.
Notes on the Distribution of Colorado Mammals, with a description of a new species of Bat (*Eptesicus pallidus*) from Boulder. By Robert T. Young.

United States—Colorado River. *Z. Ges. E. Berlin* (1909): 164–172. **Davis.**
Der Grosse Cañon des Colorado-Flusses. Von Prof. William Morris Davis. *Sections.*

United States—Forestry. *B.G.S. Philadelphia* **7** (1909): 11–20. **Cleveland.**
The National Forests from an Economic Standpoint. By Treadwell Cleveland.

United States—Geology.
Twenty-ninth Annual Report of the Director of the United States Geological Survey to the Secretary of the Interior for the Fiscal Year ended June 30, 1908. Washington, 1908. Size 9 × 6, pp. 100. *Maps.*

United States—Irrigation. *B.G.S. Philadelphia* **7** (1909): 1–10. **Blanchard.**
Reclaiming the Desert. By C. J. Blanchard. *Illustrations.*

United States—North-West. **Lyman.**
The Columbia river: its history, its myths, its scenery, its commerce. By William Denison Lyman. New York and London: G. P. Putnam's Sons, 1909. Size 9½ × 6½, pp. xx. and 410. *Maps and Illustrations. Price* 15*s.*
A popular account of the Columbia, and of the romantic history of its discovery, etc.

United States—South-West. **Girty.**
U.S. Geol. Surv., Prof. Paper No. **58** (1908): pp. 652.
The Guadalupian fauna. By George H. Girty. *Sketch-map and Illustrations.*

United States—Survey.
Department of Commerce and Labor. Report of the Superintendent of the Coast and Geodetic Survey, showing the progress of the work from July 1, 1907, to June 30, 1908. Washington, 1908. Size 11½ × 9, pp. 170. *Sketch-maps.*
One of the appendices gives the results of magnetic observations.

CENTRAL AND SOUTHERN AMERICA.

Bolivia. **Crespo.**
Ministerio de Colonización y Agricultura. Guía del viajero en Bolivia. Por Luis S. Crespo. Tom I. La Paz, 1908. Size 8½ × 6, pp. xii. and 284. *Maps and Illustrations.*
Contains a large amount of practical information.

Brazil. **Oakenfull.**
Brazil in 1909. By J. C. Oakenfull. Published under the auspices of the Brazilian Government Commission of Propaganda and Economic Expansion, [Plymouth], 1909. Size 7½ × 5, pp. 238. *Sketch-map and Illustrations. Presented by the Commission.*

Brazil—Ethnology. **Koch-Grünberg.**
Zwei Jahre unter den Indianern: Reisen in Nordwest Brasilien, 1903–1905. Von Dr. Theodor Koch-Grünberg. I. Band. Berlin: E. Wasmuth, 1909. Size 11½ × 8, pp. iv. and 360. *Map and Illustrations. Price* 11*m.* 25.

Brazil—Rubber. **Walle.**
Paul Walle. Au pays de l'or noir: Para, Amazonas, Matto Grosso. Paris: E. Guilmoto, [1909]. Size 9 × 5½, pp. 244. *Sketch-maps and Illustrations. Price* 4 *fr.* 50. *Presented by the Publisher.*

French Guiana. **Dangoise and Pottereau.**
Notes, essais et études sur la Guyane française et le développement de ses ressources variées, et spécialement de ses richesses auriferes, filoniennes et alluvionnaires. Par Arthur Dangoise et L. Pottereau (pp. 230). Autres notes et nouvelles études sur le développement économique et minier de la Guyane française, et sur les moyens de mise en valeur de ses richesses naturelles: agricoles, pastorales, forestières et auriferes. Par Arthur Dangoise (pp. 238). Paris: G. Ficker, 1909. Size 10 × 6½. *Illustrations. Presented by the Publisher.*

Patagonia and Tierra del Fuego. *J. Geology* **16** (1908): 683–697. **Penrose.**
The gold regions of the Strait of Magellan and Tierra del Fuego. By R. A. F. Penrose. *Sketch-map and Illustrations.*

Pilcomayo River. *Z. Ges. E. Berlin* (1908): 526–538. **Herrmann.**

Die Deutsche Pilcomayo-Expedition. Von Wilhelm Herrmann. *Sketch-map and Illustrations.*

South America. **Gallois.**

En Amérique du Sud: notes et impressions. Par Eugène Gallois. Paris: Librairie Africaine et Coloniale, [*not dated*]. Size 7½ × 5, pp. 300. *Illustrations. Presented by the Author.*

Travel notes by one who has done much to popularize a knowledge of distant countries.

Titicaca Lake. *Deutsche Rundschau G.* **31** (1909): 97–103, 165–171. **Payer.**

Der Titicaca-See. Von Richard Payer. *Illustrations.*

Venezuela and Columbia. **Bingham.**

The journal of an expedition across Venezuela and Columbia, 1906–1907. An exploration of the route of Bolivar's celebrated march of 1819, and of the battle-fields of Boyacá and Carabobo. By Dr. Hiram Bingham. New Haven (London: T. Fisher Unwin), 1909. Size 9½ × 6, pp. viii. and 288. *Map and Illustrations. Price* 10*s. net. Presented by the Publisher.*

Some account of this expedition was given in the *Journal* for October, 1908.

West Indies—St. Vincent. *B. American G.S.* **41** (1909): 72–83. **Hovey.**

Camping on the Soufrière of St. Vincent. By Edmund Otis Hovey. *Illustrations.*

AUSTRALASIA AND PACIFIC ISLANDS.

New Guinea—Exploration. **Wichmann.**

Nova Guinea. Résultats de l'Expédition scientifique néerlandaise à la Nouvelle Guinea en 1903, sous les auspices de Arthur Wichmann. Vol. 1, Entdeckungsgeschichte von Neu-Guinea (bis 1828). Von Dr. Arthur Wichmann. Leyden: E. J. Brill, 1909. Size 12½ × 10, pp. xviii. and 388. *Facsimile-maps. Price* 21*s. Presented by the Publisher.*

MATHEMATICAL GEOGRAPHY.

Tables. **Ambronn and Domke.**

Astronomisch-geodätische Hilfstafeln zum Gebrauche bei geographischen Ortsbestimmungen und geodätische Uebertragungen. Zusammengestellt und herausgegeben unter Mitwirkung von Bäbler von Dr. L. Ambronn und Dr. J. Domke. Berlin: E. S. Mittler & S., 1909. Size 11 × 8, pp. vi. and 142. *Diagrams. Price* 10*s.*

PHYSICAL AND BIOLOGICAL GEOGRAPHY.

Evolution. **Darwin.**

The foundations of the Origin of Species. Two essays written in 1842 and 1844 by Charles Darwin. Edited by his son, Francis Darwin. Cambridge: University Press, 1909. Size 9 × 5½, pp. xxx. and 264. *Portrait. Price* 7*s.* 6*d. net. Presented by Major Leonard Darwin.*

Oceanography—Currents. **Nielsen.**

Meddelelser Kom. Havundersøgelser, Copenhagen; Hydrografi **1** (1908): No. 11, pp. 16.

Contributions to the understanding of the Currents in the Northern part of the Atlantic Ocean. By J. N. Nielsen. *Sketch-map.*

Oceanography—North Sea. **Ostenfeld.**

Meddelelser Kom. Havundersøgelser, Copenhagen; Plankton **1** (1908): No. 6, pp. 44.

On the immigration of *Biddulphia Sinensis*, Grev., and its occurrence in the North Sea during 1903–1907, and on its use for the study of the direction and rate of flow of the currents. By C. H. Ostenfeld. *Sketch-maps.*

Oceanography—North Sea and Baltic. ———.

Conseil Explor. la Mer; B. Résultats 1906–07; *Suppl.*, pp. 78.

Résume de l'hydrographie des mers explorées par le conseil. *Maps and Diagrams.*

Oceanography—Plaice. **Johansen.**

Meddelelser Kom. Havundersøgelser, Copenhaken; Fiskeri **3** (1908): No. 5, pp. 24.

Contributions to the biology of the plaice, with special regard to the Danish plaice-fishery. IV. Is the plaice indigenous to the true Baltic? By A. C. Johansen. *Sketch-charts.*

Oceanography—Red Sea.

Berichte der Kommission für ozeanographische Forschungen: Neunte Reihe. Forschungen im Roten Meere. (Kollektiv-Ausgabe aus dem LXXX. Bande der Denkschriften der K. Akademie der Wissenschaften.) Vienna, 1907. Size 12 × 9½, pp. 98. *Illustrations.*

Oceanography—Sea-water. **Ekman.**

Conseil Explor. de la Mer; Publications de circonstance, No. 43 (1908): pp. 48.

Die Zusammendrückbarkeit des Meerwassers, nebst einigen Werten für Wasser und Quecksilber. Von V. Walfrid Ekman. *Illustrations.*

Oceanography—Sea-water. **Gehrke.**

Conseil Explor. de la Mer; Publications de circonstance, No. 45 (1909): pp. 20.

Ueber Farbe und Durchsichtigkeit des Ostseewassers, mit einen allgemeinen Theorie des Zusammenhanges zwischen Farbe und Durchsichtigkeit in natürlichen Gewässern. Von Johan Gehrke.

Oceanography—Sea-water. **Jacobsen.**

Medelelser Kom. Havundersøgelser, Copenhagen; Hydrografi **1** (1908): No. 10, pp. 26.

Mittelwerte von Temperatur und Salzgehalt, bearbeitet nach hydrographischen Beobachtungen in dänischen Gewässern 1880–1907. Von J. P. Jacobsen. *Charts and Diagrams.*

Oceanography—Sea-water. **Jacobsen.**

Meddelelser Kom. Havundersøgelser, Copenhagen; Hydrografi **1** (1908): No. 12, pp. 24.

Der Sauerstoffgehalt des Meereswassers in den dänischen Gewässern innerhalb Skagens. Von J. P. Jacobsen. *Diagrams.*

Oceanography—Sea-water. *B.S.G. l'Est* **29** (1908): 129–152. **Thoulet.**

La Transparence des eaux. Par M. J. Thoulet.

Phytogeography—Marsh plants. **Yapp.**

On stratification in the vegetation of a marsh, and its relations to evaporation and temperature. By R. H. Yapp. (From the *Annals of Botany*, vol. **23**, No. 90; [London], April, 1909.) Size 9½ × 6½, pp. 275–319. *Diagrams and Illustrations.*

Noticed in the Monthly Record, August, p. 219.

Rivers. *J. Geology* **16** (1908): 755–764. **Davis.**

A study of river meanders on the middle Rouge. By Darrell H. Davis. *Sketch-maps and Illustrations.*

Rocks. **Harker.**

The natural history of igneous rocks. By Alfred Harker. London: Methuen & Co., 1909. Size 9 × 5½, pp. xvi. and 384. *Sketch-maps, Illustrations, and Sections. Price* 12*s.* 6*d. net. Presented by the Publishers.*

Snow—"Nieves Penitentes." *Petermanns M.* **54** (1908): 285–286. **Langenbeck.**

Büsserschnee in den Walliser Alpen. Von Prof. Dr. R. Langenbeck.

Swallow-holes. *J.R. Engineers J.* **9** (1909): 365–370. **Pitt.**

Swallow-holes in chalk. By Col. W. Pitt. *Sections.*

A condensed version of this paper appeared in the *Journal* for February last (p. 196).

Volcanoes—Nomenclature. *Globus* **95** (1909): 253–255. **Spethmann.**

Der Begriff "Caldera." Von Hans Spethmann.

ANTHROPOGEOGRAPHY AND HISTORICAL GEOGRAPHY.

Commercial Geography. **Andree.**

Karl Andree's Geographie des Welthandels, vollständig neu bearbeitet von einer Anzahl von Fachmännern und herausgegeben von Dr. Franz Heiderich und Dr. Robert Sieger. I. Band, 1. Hälfte. Frankfort-a-M.: H. Keller, 1909. Size 10 × 7, pp. 1–428. *Portrait and Maps. Price* 6*s.* 6*d.*

The first part of a re-issue of this well-known work, entirely re-cast.

Historical—Galileo. **Müller.**

Der Galilei-Prozess (1632–1633) nach Ursprung, Verlauf und Folgen. Dargestellt von Adolf Müller, S.J. Freiburg i. Br.: Herder, 1909. Size 9 × 6, pp. viii. and 206. *Price* 3*m.* 60. *Presented by the Publisher.*

Historical—Münster. **Wolkenhauer.**

Sebastian Münsters handschriftliches Kollegienbuch aus den Jahren 1515–1518 und

seine Karten. (Cod. lat. 10,691 der Königlichen Hof- und Staatsbibliothek zu München.) Von August Wolkenhauer. (Abhandlungen der K. Gesellschaft der Wissenschaften zu Göttingen; Philologisch-Historische Klasse. N.F., Bd. xi., Nr. 3.) Berlin: Weidmann, 1909. Size 11 × 9, pp. 68. *Facsimile-maps. Purchased.*

An interesting description of the manuscript note-book, with maps, of the author of the sixteenth-century 'Cosmographia.'

Military Geography. **May.**

An introduction to military geography. By Brigadier-General E. S. May. London: H. Rees, 1909. Size 8½ × 5½, pp. xvi. and 274. *Maps. Price 8s. 6d. net. Presented by the Publisher.*

BIOGRAPHY.

Darwin. **Seward and others.**

Darwin and modern science: essays in commemoration of the centenary of the birth of Charles Darwin and of the fiftieth anniversary of the publication of 'The Origin of Species.' Edited . . . by A. C. Seward. Cambridge: University Press, 1909. Size 9½ × 6½, pp. xviii. and 596. *Portrait and Illustrations. Price 18s. net. Presented by Major Darwin.*

Laws. **Johnston.**

Dr. Laws of Livingstonia. By James Johnston. London: S. W. Partridge & Co., [1909]. Size 7½ × 5, pp. 160. *Maps, Portraits, and Illustrations. Price 1s. 6d. Presented by the Publishers.*

Roosveldt. **Vrooman.**

Theodore Roosveldt, dynamic geographer. Based on a lecture delivered to the School of Geography, Oxford University, March 8, 1909. By Frank Buffington Vrooman. London: H. Frowde, 1909. Size 9 × 5½, pp. 106. *Price 3s. net. Two copies, presented by the Author and Publisher.*

GENERAL.

Education. **Telles.**

IX^e^ Congrès International de Géographie, Genève, 1908. L'enseignement supérieur de la géographie. Par le Dr. Silva Telles. Lisbon, 1908. Size 8½ × 6, pp. 8.

Education—Text-book. **Brown and Johnson.**

The New Outlook Geography. How people live. By W. C. Brown and P. H. Johnson. London: G. G. Harrap & Co., 1909. Size 7½ × 5, pp. 252. *Sketch-maps and Illustrations. Presented by the Publishers.*

Education—Text-books. **Herbertson.**

The Oxford Geographies, edited by A. J. Herbertson. The Elementary Geography. Vol. 1: A first physiography. By F. D. Herbertson. (Pp. 80.) Vol. 3: Europe, excluding the British Isles. By the same. (Pp. 112.) Oxford: Clarendon Press, 1909. Size 7½ × 5. *Maps and Illustrations. Prices 10d. and 1s. respectively. Presented by the Publishers.*

Geographical Congress.

Exposition Coloniale de Marseille, 1906. Congrès de l'Alliance Française et des Sociétés de Géographie tenu à Marseille du 10 au 15 September, 1906. Compte-rendu des travaux du Congrès. Marseilles, 1908. Size 10 × 6½, pp. 286. *Presented by the Congress.*

Geographical Congress. *M. k.k. G. Ges. Wien* **51** (1908): 433–452. **Oberhummer.**

Die Entwickelung der Erdkunde in Österreich seit der Mitte des 19. Jahrhunderts. Von Prof. Dr. Eugen Oberhummer.

Geography in Germany. *Z. Ges. E. Berlin* (1909): 258–268. **Tiessen.**

Zur Förderung der wissenschaftlichen Landeskunde in Deutschland. Von Dr. E. Tiessen.

Geological Society. **Watts.**

The centenary of the Geological Society of London, celebrated September 26 to October 3, 1907. Recorded by Prof. W. W. Watts. London: Longmans & Co., 1909. Size 9 × 6, pp. vi. and 166. *Portrait.*

Tropical Diseases.

Report of the Advisory Committee for the Tropical Diseases Research for the year 1908. London: Wyman & Sons, 1909. Size 13 × 8½, pp. 82. *Illustrations. Price 1s.*

NEW MAPS.

By E. A. REEVES, *Map Curator*, R.G.S.

EUROPE.

Austria. **Freytag.**

G. Freytag's Ausflugskarten. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Sheets: VI. Reisalpe und Unterberg; XV. Das Gesäuse und seine Berge; XVII. Wachau und Dunkelsteiner Wald; XXII. Waidhofen a.d. Ybbs und Umgebung. Vienna: G. Freytag & Berndt, [1909]. *Price per sheet*, 40 *heller*. *Presented by the Publisher.*

Austria. **Freytag.**

Touristen-wanderkarte der Niederösterr.-Steirischen Alpen und Voralpen (Oestlicher Theil). Bearbeitet von G. Freytag. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. Vienna: G. Freytag & Berndt, [1909]. *Price* 2 *kr.* *Presented by the Publisher.*

Austria-Vienna. **Freytag.**

G. Freytag's Wiener Bezirksplankarten. XV. Bezirk-Fünfhaus. Scale 1 : 10,000 or 6·3 inches to 1 stat. mile. *Price* 12 *heller*. XIX. Bezirk-Döbling. Scale 1 : 20,000 or 3·2 inches to 1 stat. mile. *Price* 20 *heller*. Vienna: G. Freytag & Berndt. [1909]. *Presented by the Publisher.*

Austria-Vienna. **Freytag.**

G. Freytag's Plan des Verkehrszentrums von Wien. Neue, erweiterte Ausgabe. Scale 1 : 20,000 or 3·2 inches to 1 stat. mile. Vienna: G. Freytag & Berndt, [1909]. *Price* 40 *heller*. *Presented by the Publisher.*

British Isles—England and Wales. **Ordnance Survey.**

Sheets published by the Director-General of the Ordnance Survey, Southampton, from August 1 to 31, 1909.

County Diagrams, 4 miles to 1 inch, showing civil parishes with a table of their areas. **Carmarthenshire.** *Price* 6*d.*

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Germany. **Groll.**

Priebatsch's Schulwandkarte der Provinz Schlesien. Bearbeitet und gezeichnet von Dr. M. Groll. Scale 1 : 200,000 or 1 inch to 3·2 stat. miles. 4 sheets. Breslau: Verlag von Priebatsch's Buchhandlung, [1909]. *Presented by Dr. M. Groll, Berlin.*

A boldly executed school wall-map, showing relief of land colour tinting over brown hill-shading. The colouring is somewhat overdone, and in the higher districts rather obscures the lettering. An inset is given showing density of population and industrial districts.

Spain. **Instituto Geografico y Estadistico, Madrid.**

Mapa Topografica de España. Scale 1 : 50,000 or 1·3 inch to 1 stat. mile. Sheets: 626, Calera; 947, Jaén; 948, Torres; 965, Ecija; 967, Baena; 968, Alcaudete; 988, Puente-Genil. Madrid: Instituto Geografico y Estadistico, 1905–07.

Switzerland. **Attinger.**

Geographischer, volkswirtschaftlicher, geschichtlicher Atlas der Schweiz. Neuenberg: Gebrüder Attinger, [1909]. *Price 8m.*

This little atlas of Switzerland contains forty-eight sheets of well-executed coloured maps. Amongst other subjects dealt with are the political divisions, character of soil, relief, river systems, geology, rainfall, flora, distribution of population, military divisions and stations, language, religion, and history of the country. In addition there are large-scale maps of the principal lakes. Some of these maps are of special interest and worthy of careful study.

ASIA.

Asia. **Survey Department, Cairo.**

School Wall Map of Asia. [In Arabic.] Scale 1 : 6,000,000 or 1 inch to 94·7 stat. miles. 4 sheets. Cairo: Survey Department, 1909. *Presented by the Director-General, Survey Department, Cairo.*

One of the series of general wall-maps now being prepared at the Survey Department at Cairo, for use in the schools of Egypt. Relief is shown by hill-shading, and the lettering is in Arabic. The characteristic physical features are not so clearly brought out as might be desired in an educational map.

Java. **Topographical Bureau, The Hague.**

Topographische Kaart der afdeelingen Probolinggo, Kraksaän en Loemadjang van de Residente Pasoeroean. Opgenomen ingevolge Gouvernements besluit van den 6ten Juli 1866 No. 8 in de Jaren 1875–1880. Herziene druk 1908–1909. Scale 1 : 100,000 or 1 inch to 1·6 stat. mile. 4 sheets. The Hague: Topographische Inrichting, 1909.

Like most of the Dutch Government maps of the Java, this is a good specimen of printing so far as a selection of colour and registration are concerned; but in the mountainous regions the shading is much too dark for legibility. By means of colour tinting and symbols much information is given concerning plantations, cultivated lands, means of communication, and other matters.

AFRICA.

Congo Free State.

Carte de l'État Indépendant du Congo. Scale 1 : 1,000,000 or 1 inch to 15·7 stat. miles. 12 sheets. [Brussels], 1907.

A large-scale general map compiled chiefly from the route surveys of Congo Free State officials, combined with other authorities up to the date of publication. A considerable amount of detailed information is given for the first time, although probably much of this is of a sketchy nature. On the south-west corner sheet is given a shaded relief map of the Congo Basin.

Egypt. **Survey Department, Cairo.**

Physical school map of Egypt. Scale 1 : 750,000 or 1 inch to 11·8 stat. miles. 6 sheets. Cairo: Survey Department, 1909. *Presented by the Director-General, Survey Department, Cairo.*

An edition in English of a good general wall-map of Egypt, of which the Arabic edition was noticed in the *Geographical Journal* for September last. It has been prepared in the Survey Department at Cairo for use in Egyptian schools.

Egypt. **Survey Department, Cairo.**

Topographical map of Egypt. Scale: 1 : 10,000 or 6·3 inches to 1 stat. mile. Sheets: N.E. 10–8, 9, Shargia province. Cairo: Survey Department, 1909. *Presented by the Director-General, Survey Department, Cairo.*

Egypt—Alexandria. **Survey Department, Cairo.**

Town plan of Alexandria. Scale 1 : 1000 or 63·36 inches to 1 stat. mile. Sheets: 21–23, 25, 26, 27, 28, 31; 22–24, 25, 28, 29, 30, 31; 23–25, 26, 27, 29, 30, 32; 24–26, 27, 28, 29, 31, 32; 25–28, 29, 30, 31, 32, 33; 26–30, 32, 33. Cairo: Survey Department, 1909. *Presented by the Director-General, Survey Department, Cairo.*

Gambia. **Geographical Section, General Staff.**

Gambia. Scale 1 : 500,000 or 1 inch to 7·9 stat. miles. London: Geographical Section, General Staff, 1909. *Price 2s. Presented by the Director of Military Operations.*

AMERICA.

Canada. **Department of Militia and Defence, Ottawa.**

Topographic map of Canada. Scale 1 : 63,360 or 1 inch to 1 stat. mile. Sheet 17, Cornwall, Ontario-Quebec. Ottawa: Department of Militia and Defence. London: Geographical Section, General Staff, War Office, 1909.

Canada. **Department of the Interior, Ottawa.**

Map of Manitoba, Saskatchewan, and Alberta. Scale 1 : 792,000 or 1 inch to 12·5 stat. miles. 4 sheets. Ottawa: Department of the Interior, 1909. *Presented by the Department of the Interior, Ottawa.*

This is a new edition revised to June, 1909.

Canada. **Department of the Interior, Ottawa.**

Standard topographical map of Canada. Scale 1 : 250,000 or 1 inch to 3·9 stat. miles. Sheet 2 N.E., Belleville, Ontario. Scale 1 : 500,000 or 1 inch to 7·9 stat. miles. Sheet 28, English river, Ontario. Ottawa: Department of the Interior, 1909 *Presented by the Department of the Interior, Ottawa.*

Canada. **Geographical Section, General Staff.**

Topographic map of Canada. Scale 1 : 126,720 or 1 inch to 2 stat. miles. Sheet: Brockville, Ontario. London: Geographical Section, General Staff, 1909. *Price 2s. 6d. each sheet. Presented by the Director of Military Operations.*

Paraguay. **Criado.**

Mapa de la Republica del Paraguay. Por Matias Alonso Criado. Segunda Edición. Scale 1 : 1,200,000 or 1 inch to 18·9 stat. miles. Montevideo: A. Barreiro y Ramos, 1907.

The second edition of a general map of Paraguay, with a description of the geography, meteorology, etc., of the country, printed on the back.

CHARTS.

Admiralty Charts. **Hydrographic Department, Admiralty.**

Charts and Plans published by the Hydrographic Department, Admiralty, during August, 1909. *Presented by the Hydrographer, Admiralty.*

New Charts—No. 2172, England, south coast: Swanage bay, 2s. 2581, Orkney islands: Scapa flow and approaches, southern sheet, 3s. 3729, Orkney islands: Scapa flow and approaches, northern sheet, 4s. 3733, Baltic sea, approaches to Abö: Utö to Venö, 3s. 3734, North America, east coast, River St. Lawrence: South traverse, 3s. 2785, Eastern archipelago. Plans on the south coast of Sumbawa island: Chempi bay, Kelapa island, Waworada bay, 2s. 1348, Borneo: North Natuna islands, 4s. 3735, China, north-east coast: Cape Yatau to Tau Tsui head, 3s.—**New Plans and Plans added.** 3709, Ireland, east coast, Copeland islands and Donaghadee sound. Plan added: Donaghadee harbour, 3s. 1320, Spain, east coast, Cape San Antonio to Cape Tortosa. Plan added: Port Sagunto, 3s. 919, Anchorages in the Gulf of Aden. Plan added: Hais anchorage, 2s.

Atlantic, North. **U.S. Hydrographic Office.**

Pilot chart of the North Atlantic ocean, August, 1909. Washington: U.S. Hydrographic Office, 1909. *Presented by the U.S. Hydrographic Office.*

Atlantic, North, and Mediterranean. **Meteorological Office.**

Monthly meteorological charts of the North Atlantic and Mediterranean, September, 1909. London: Meteorological Office, 1909. *Price 6d. Presented by the Meteorological Office.*

Chile. **Oficina Hidrografica de Chile.**

Chilian Hydrographic Charts. Nos.: 92, Puerto Montt; 122, Canal Señoret i Estero Eberhardt; 145, Estuario Silva Palma. Valparaiso: Oficina Hidrografica de Chile, 1909. *Presented by the Chilian Hydrographic Office.*

Indian Ocean. **Meteorological Office.**

Monthly meteorological charts of the Indian Ocean north of 15° S. lat. and Red Sea, September, 1909. London: Meteorological Office, 1909. *Price 6d. Presented by the Meteorological Office.*

Pacific, North. **U.S. Hydrographic Office.**

Pilot chart of the North Pacific Ocean, September, 1909. Washington: U.S. Hydrographic Office, 1909. *Presented by the U.S. Hydrographic Office.*

Pacific, South. **U.S. Hydrographic Office.**

Pilot chart of the South Pacific Ocean, September, October, and November, 1909. Washington: U.S. Hydrographic Office, 1909. *Presented by the U.S. Hydrographic Office.*

PHOTOGRAPHS.

Arctic Regions. **Amundsen.**

Two hundred and forty-seven photographs taken during the voyage of the *Gjöa* through the North-West Passage in 1903–1907 by Captain Roald Amundsen. *Presented by Captain Roald Amundsen.*

Many of these photographs were shown as lantern-slides when Captain Amundsen described his voyage at the meeting of this Society in February, 1907, and a selection appears in his book.

(1) Iceberg in Baffin bay; (2) The inspector of North Greenland, Mr. Daugaard-Jensen, his wife, and sister-in-law; (3) Godhavn; (4) View from Godhavn; (5) Arctic Highlanders; (6 and 7) Arctic Highlanders from Cape York; (8) The Danish Literary Greenland Expedition under Mylius Erichsen at Dalrymple rock; (9) Eskimo women from Godhavn; (10) Disco island; (11) The Belcher monument and Franklin memorial on Beechey island; (12 and 13) Ruins of the Franklin depôt on Beechey island; (14) *Gjöa* aground on the banks between Matty island and Boothia; (15) King William Land; (16) King William Land: Eskimo tent ring; (17) The meteorological station at King William Land; (18) Part of King William Land in summer, 1908; (19) Vegetation of King William Land; (20 and 21) Ruins of old stone houses, King William Land; (22) Discharging, King William Land; (23) A hunting party, King William Land; (24 and 25) Boat excursion along the shore of King William Land; (26) Silla with her puppies; (27) Messrs. Ristvedt and Wiik in their hut on King William Land; (28) View from Pfeffer river; (29) Great loon, King William Land; (30) One of the Franklin graves on the southern shore of King William Land; (31) The *Gjöa* at anchor in Gjöahavn; (32 and 33) The land around Gjöahavn; (34) Landing our goods at Gjöahavn; (35 and 36) Winter quarters, Gjöahavn, 1903–04; (37 and 38) Winter quarters, Gjöahavn, 1904–05; (39) Gjöahavn, spring, 1904; (40 and 41) Gjöahavn, summer, 1905; (42 and 61) Summer on board the *Gjöa*, 1904; (43 and 44) Summer scenes, Gjöahavn; (45) Summer excursion, Gjöahavn; (46) Vegetation at Gjöahavn; (47) Northward to the magnetic pole, spring, 1904; (48 and 49) Ready to start for the magnetic pole; (50) Our tent on the magnetic north pole; (51) Lindström valley, moonlight scene; (52) Feast in the cabin, Gjöahavn, 1904; (53) Some of our dogs; (54, 59, and 60) Our astronomical observatory at Gjöahavn; (55) Building the magnetic variation house at Gjöahavn; (56) The magnetic variation house at Gjöahavn; (57 and 58) The absolute magnetic observatory at Gjöahavn; (62) Mr. Gustav Wiik in Nechilli Eskimo costume; (63 and 64) The members of the expedition in Nechilli costume; (65) A magnetic observatory on Boothia Felix, in the vicinity of the magnetic pole; (66 and 67) On the way to King Haakon VII. coast; (68) On King Haakon VII. coast; (69) Lieut. Godfred Hansen, Gjöahavn, 1904; (70) Mr. Anton Lund, the mate of the *Gjöa*, spring, 1906; (71) Christmas, 1903, on board the *Gjöa*; (72) Scene on board the *Gjöa*, summer, 1904; (73) Some of our dogs; (74) "Ole," one of our dogs; (75 and 76) The cook, Mr. Adolf H. Lindström; (77) Christmas fun on board, 1903; (78) Feast on board the *Gjöa*; (79) Our mail carrier from Hudson bay; (80) Nechilli Eskimo tent ring; (81) Nechilli village on King William Land, 1904; (82 and 83) Talurnikto, a Nechilli Eskimo; (84) Magito, a Nechilli woman; (85) A Nechilli camp on the ice in Rae strait; (86) Nechilli coming to the ship to barter; (87) Umiktuallu, a Nechilli archer; (88) Akla and his son; (89) Alimgan in his igloo, Gjöahavn; (90) Uglen, a Nechilli, our best friend; (91) Nechilli children as archers; (92) Ojara and Alo-Alo before their hut; (93) Nechilli building igloo; (94) Kabloka, a Nechilli woman; (95) Visitors to the cabin; (96) A Nechilli man as smith; (97 and 98) Nechilli woman showing tattooed arm; (99) Nechilli Eskimo starting on a journey; (100) Nechilli village on the ice in James Ross strait; (101, 112, and 115) Nechilli village at Gjöahavn; (102) Nechilli breaking camp; (103) Ugpi with his mother and wife in his igloo; (104) A double Eskimo igloo; (105) A Nechilli snow village; (106) Ojara and Alerpa at the

ship; (107) A Nechilli party ready for fishing; (108) A Nechilli village; (110) Magito, the beauty of Gjöahavn; (111) Talumakto, a Nechilli man; (113) Ahira and Alo-Alo, Nechilli family travelling; (114) On the threshold, Nechilli woman at the entrance to her snow-hut; (116) Interior of a Nechilli snow-hut; (117) Nechilli in summer; (118) Nechilli in their snow-hut; (119) Nechilli who will not be photographed; (120) Praederik and his wife in their snow-hut; (121 and 130) Kabloka, Nechilli woman seventeen years old; (122 and 126) Nechilli family in their tent; (123 and 124) A Nechilli grave on King William Land; (125) Nechilli pitching camp; (127) Umiktuallu, Nechilli man, about thirty years old; (128) Alo-Alo; (129 and 137) Atikleura and his family in their snow-hut; (131) Nechilli and their tent; (132) Onaller, a Nechilli wife; (133) Drying fish; (134) A Nechilli family in their hut; (135) Good friends on board the *Gjöa*; (138) Our adopted child, Manni, a Nechilli man; (139 and 140) Nechilli tent on King William Land; (141) Onaller with child; (142 and 143) Nechilli in the cabin of the *Gjöa*; (144) Nechilli eating deer bowels; (145) A living boot-jack; (146) The photographer in action; (147) Nechilli cutting up a dead seal; (148–152) Catching salmon; (153) An ice-house; (154 and 155) Nechilli seal-hunting outfit; (156) A Nechilli kayak under construction; (157) Kirnir, a Ichyuachtorvik Eskimo; (158) Kirnir in his kayak; (159–161) Utkohikchyalli woman showing tattooed arm; (162) A Utkohikchyalli woman, about twenty-five years old; (163) Akovia, a Ogluli in his kayak; (164) An Ogluli repairing his sledge; (165 and 166) An Ogluli family; (167) Ivajarra, Ogluli man; (168) Nalungia with her daughter, Ogluli woman; (169) Ogluli woman with child; (170) Ogluli on board the *Gjöa*; (171–173) Winter quarters at King point, 1905–06; (174–176) King point, winter, 1905–06; (177) On the pack-ice, King point; (178–185) King point, spring, 1906; (186–190) King point, summer, 1906; (191) The land around King point; (192) The beach, King point; (193) Driftwood on the beach, King point, 1906; (194) Midsummer feast, King point; (195, 196) Summer scenes at King point; (197–199) Vegetation at King point; (200–203) Wiik's grave at King point; (204) The wreckage of the *Bonanza*, King point, 1906; (205) The wrecked whaler *Bonanza*, of San Francisco, King point; (206) The *Gjöa* and the wrecked whaler *Bonanza* at King point; (207) Our dwelling-house made of drift timber at King point; (208) May 17, the Norwegian National Day, at King point, 1906; (209) American whalers coming into King point; (210–213) Old ice at King point, 1905–06; (214 and 215) Scenes from King point, spring, 1906; (216) King point; (217) Ice out from King point; (218) View from King point; (219, 220) Land around King point; (221) A weather picture from King point; (222, 223) The coast between King and Key points; (224) Eskimo life at King point; (225) Eskimo visitors; (226) Eskimo girl at King point; (227) Eskimo at King point; (228) Kunak and his family, King point; (229) Eskimo scene at King point; (230) Eskimo woman and child, King point; (231, 232) Young Eskimo beauties, King point; (233) Eskimo igloo, King point; (234) Eskimo sailing, King point; (235) Eskimo tents, Kingi point; (236) The American whaling fleet at Herschel island, 1905–06; (237) American sailors of the whaling fleet giving a concert; (238) The harbour, Herschel island; (239) The *Gjöa* meeting the first vessel on the American side; (240) Pack-ice on the north coast of America; (241) Kappa, an Eskimo woman from Kotzebue sound, Alaska; (242) Anakto, an Eskimo man from Herschel island; (243) Eskimo graves on Herschel island; (244) Eskimo village on Herschel island; (245) Eskimo woman from Herschel island; (246) The *Gjöa* being towed into San Francisco, October, 1906; (247) The *Gjöa* entering San Francisco.

East Africa. **MacQueen-Dutkewich Expedition.**

Eighteen photographs of British and German East Africa, taken by the MacQueen-Dutkewich Expedition, 1908. *Presented by Messrs. Underwood & Underwood, New York, and Peter MacQueen, Esq.*

These are good enlargements measuring 12 inches × 10 inches.

(1) Ceremony of honouring a chief's son who has killed a lion with a spear; (2) Climbing through a tropical jungle, gorge of Rau river; (3) Picturesque Masai watching the popular game of "bao"; (4) Picking coffee in Moschi province; (5) Warriors and women of a village near Mount Kenia in festival dress; (6) Grinding corn; (7) A beautiful waterfall under the equatorial sun, Mount Kenia district; (8) Kavirondo people and hedged villages on plain north of Victoria Nyanza; (9) A Kavirondo village near Victoria Nyanza; (10) Hauling a hippopotamus to the shore of Victoria Nyanza; (11) The beginning of the historic Nile, flowing from Victoria Nyanza; (12) Huge crocodile just landed, beside the upper Nile; (13) Greetings and gossip among native women in a village of equatorial Africa; (14) Our photographer and his party, Seringeti plain; (15) A Wachagga village on the slopes of Kilimanjaro; (16) Hunters on the fever-haunted veldt below Kilimanjaro; (17) Eternal snow amid equatorial

jungles, Kilimanjaro; (18) "The top of Africa," Mr. Peter MacQueen, on the Kibo of Kilimanjaro, at 19,200 feet, top summit 19,321 feet.

Northern Nigeria. **Moiser.**

One hundred and forty photographs of the Birnin Kebbi district, Northern Nigeria, taken by B. Moiser, Esq. *Presented by B. Moiser, Esq.*

The district in which these photographs were taken lies between Sokoto and Illo, on the Niger. The native types and dwellings are specially good, and nearly all are clear and satisfactory. Mr. Moiser has carefully described them, and given a sketch-map showing the district, which is most useful for purposes of identification.

(1) European rest-house, Katami; (2) Scene in compound of rest-house, Katami; (3) Fulani woman and girl, Godongagi; (4) Making "zana" mats; (5) Blind old women being led into Godongagi; (6) Fulani woman with water-calabash; (7) A young Fulani woman; (8 and 9) A Fulani girl; (10) An old Fulani woman; (11) An old Hausa woman; (12) In the bush near Ujario; (13) The European station, Birnin Kebbi; (14 and 15) The medical officer's house, Birnin Kebbi; (16) The meteorological instruments; (17) The fort, Birnin Kebbi; (18) The barracks and fort, looking north; (19) Footpath at base of bluff, Birnin Kebbi; (20) On the base of the ironstone hills; (21) On the flat-topped ironstone hills; (22) Afternoon scene in barracks of West African Field Force; (23) A favourite game in the barracks; (24) Sergt.-Major, A company, with his wives; (25) The Resident waiting with the Emir of Birnin Kebbi for the salute; (26) Soldiers burying a comrade; (27) Open view in the fadama, looking north; (28) On the edge of a rice field; (29) Farmer preparing ground for rice cultivation; (30) A stack of rice; (31) Threshing the rice; (32) Small farmstead; (33) Granary for rice; (34) Ponds in fadama, dry season; (35) A glade in the fadama; (36) Setting out for evening's duck-shooting; (37) Canoes in mid-fadama, wet season; (38) Canoes laden with corn at small village in mid-fadama; (39) Duck-shooting on island in mid-fadama, wet season; (40 and 41) Scenes at fadama landing-places; (42) Making canoe from stem of Giginia palm; (43) In a small fadama, 3 miles south of Birnin Kebbi; (44) Water-lilies in fadama; (45) The Emir of Birnin Kebbi, with bodyguard and trumpeters; (46) The Emir leaving Birnin Kebbi for Sokoto; (47) Women of harem of Emir leaving for Sokoto; (48) The east gate of Birnin Kebbi; (49) A street in Birnin Kebbi; (50) A typical compound; (51) A bluff, composed chiefly of kaolin; (52) A well within Birnin Kebbi; (53) Man drawing water from well; (54) Woman drawing water; (55) House of the "Majindadi," an official of the Emir's court; (56) Fulani cows and calves; (57) Plaiting grass for mat; (58) Group of Hausa boys; (59) Hausa woman making clay pots; (60) In the market: a butcher's stall; (61) A stall of European goods; (62) A stall of miscellaneous native ware; (63) A bank of wild convolvulus; (64) Farmer hoeing among young corn; (65) Farmer cutting corn from stalks; (66) Stacks of guinea corn; (67) Bringing the corn into town; (68) House-building, binding guinea-corn stalks to form rafters; (69) Thatching the roof; (70) Placing the thatched roof on wall of house; (71) Building a European's house; (72) The blacksmiths at work; (73) The blacksmith's bellows; (74) Group of servants of European; (75) A freed slave boy; (76) Hausa woman, showing usual type of headdress; (77) Hausa woman carrying her child; (78) Hausa woman and native cat; (79) An old Fulani woman; (80) Hausa woman cooking food; (81) The "Majindadi" and his horse; (82) The Emir's messenger; (83) Group of wives of soldiers; (84 and 85) A young houseman; (86) Young Fulani woman, showing raised tattoo marks; (87) A Yoruba native; (88) A Yoruba woman; (89) A tame ostrich; (90) A Sokoto pony; (91) Trimming a pony's hoofs; (92) Group of Fulanis in camp; (93) An old bearded Fulani; (94) Fulani woman cooking food in camp; (95) Fulani woman and child; (96) Group of Fulani boys; (97) Tower of king's house, Kalgo; (98) Figures on wall inside house in king's compound, Kalgo; (99) Canoe used as public ferry, Kalgo; (100) Fishing-nets, Sabonbirni; (101) Fulani woman at Sabonbirni; (102) In the fadama at Ettene; (103 and 104) Views over fadama at Bokwoi; (105) At side of fadama, Zokua; (106) A mare and foal, Zokua; (107) On the road near Zokua; (108) European rest-house, Dakingarri; (109) Exterior of Fulani house, Dakingarri; (110) Interior of Fulani house; (111) Native filter; (112) Fulani man in Dakingarri; (113) On the road; (114) At a forest pool near Dakingarri; (115) Two travellers resting; (116) Remains of stockade around Algenari; (117) "The masallachi" (place of worship) at Algenari; (118) In forest of palm trees; (119) Woman scaring birds away from ripening corn; (120 and 121) River Niger at Sabongarri; (122) The fort, Illo; (123) The barracks, Illo; (124) The Emir of Illo; (125) Women and children bathing and fetching water from river, Illo; (126) An ingenious method of carrying water; (127) Hausa woman, showing raised tattoo marks on abdomen; (128) Hausa woman painting her face; (129–132) Hausa women; (133) Woman threshing guinea-corn;

(134) Nest of red bishop bird; (135) The town wall, Alelu; (136) Place outside Alelu appointed for winnowing corn; (137) Scene in the market, Janduchi; (138) Farmer taking guinea-corn to market, Janduchi; (139) Beehive in tree, Janduchi; (140) A Hausa man, native of Argungu, at Janduchi.

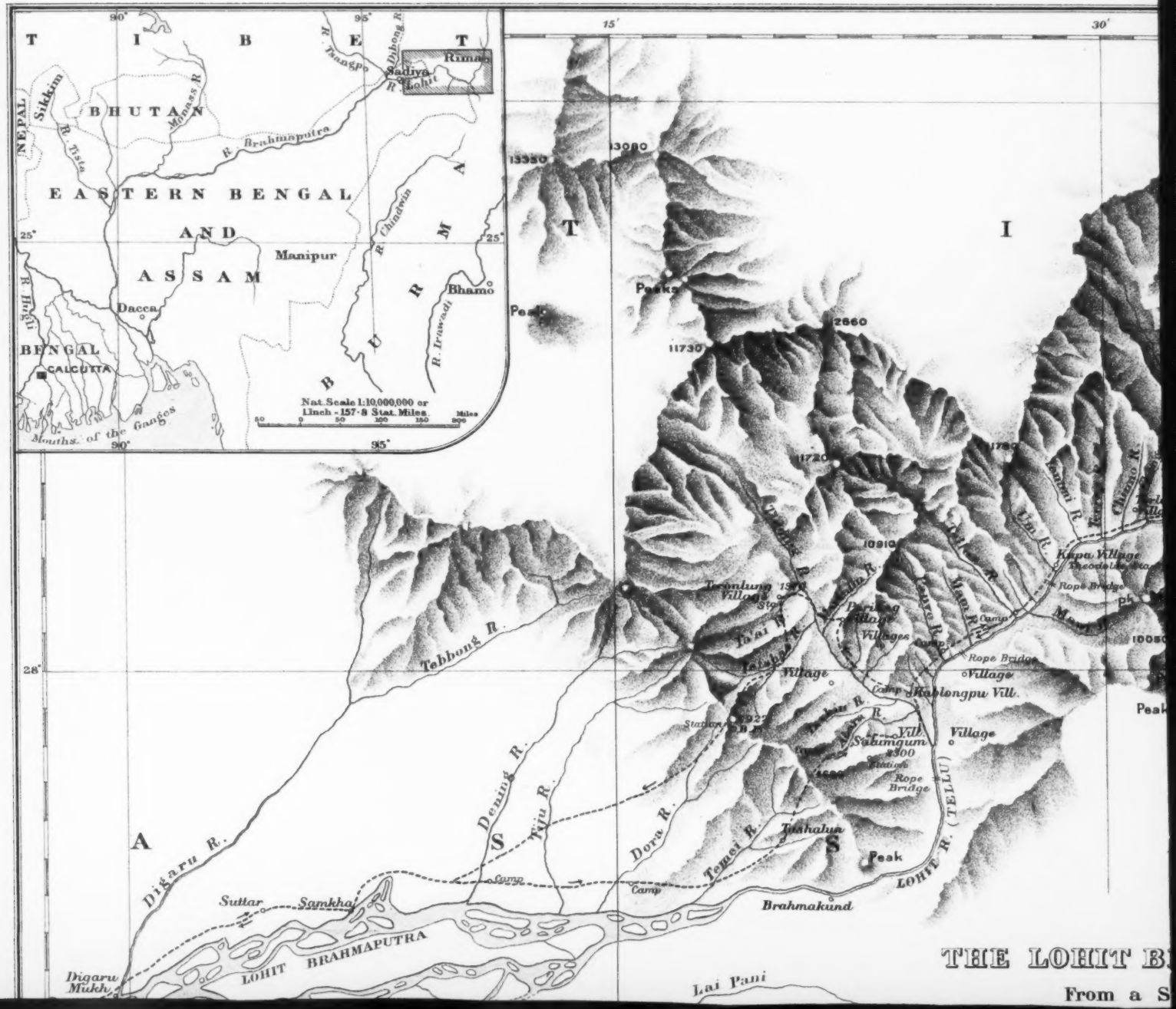
Venezuela and Colombia. **Rice.**

Ninety-one photographs taken during a journey from Caracas to Bogota, in 1907, by Hamilton Rice, Esq., M.D., M.A. *Presented by Hamilton Rice, Esq., M.D., M.A.*

Many parts of the route followed by Dr. Hamilton Rice are very little known, and these photographs have therefore special value. An account of this journey appeared in the *Geographical Journal* for October, 1908, accompanied by a map.

(1) The cargo mules shortly before reaching Zipaquira; (2) The battlefield of Boyaca from the south; (3) The battlefield and monument of Boyaca; (4) The battlefield of Boyaca; (5) Part of the battlefield of Boyaca; (6) Bolivar's headquarters during the battle of Pantano de Vargas; (7) The battlefield of Pantano de Vargas from the north; (8) Corrales de Bonza in the valley of Sogamoso; (9 and 11) The plateau and valley of Sogamoso; (10) The plaza of Nobsa; (12) Corrales and the Sogamoso river; (13) The valley of Sogamoso near Corrales; (14) The valley of Sogamoso near Socha; (15) A corner of the plaza, Laguna Seca; (16) The paramo of Pisva from the north; (17) On the road to the paramo of Pisva; (18) The last hut before the climb to the paramo of Pisva; (19) The valley of the Paya near Tovacar; (20) The main street, Pisva; (21) The valley of the Paya from a point between Paya and Pisva; (22) The plaza of Paya; (23) The majority of the residents of Morcote; (24) The Morcote church; (25) Morcote; (26) The plaza of Nunchia; (27) Dr. Rice and the theodolite on the plaza of Nunchia; (28) Our cargo mules near Nunchia; (29) The llanos of Casanare from the volcanic foothills near El Desecho; (30) Stocks in the old Spanish jail, Pore; (31) Pore, the principal corner during the annual fair; (32) The llanos of Casanare, between Corrazales and Chire; (33) One of the foothills of the Andes; (34) The caravan resting in the llanos of Casanare; (35) Our caravan in the llanos of Casanare; (36) Puerto San Salvador; (37) A house on the plaza of Puerto San Salvador; (38) Puerto San Salvador from the left bank of the Casanare; (39) "Limbo" ranch; (40) Making a chinchora hammock at "Limbo" ranch; (41) Crossing the llanos of Casanare between the Ele and Cravo rivers; (42) Guajivos Indians in the llanos of Casanare; (43) The only Guajivos we saw with a head-dress; (44) Young boys of the Guajivos near the Rio Ele camp; (45) Our camp on the Rio Ele; (46 and 47) Guajivos Indians in our camp on the Rio Ele; (48) Alligators; (49) Capybaras; (50 and 52) Capybaras in the jungle near Gualatalito; (51) Capybaras and alligators; (53) The major-domo of the Gualatalito ranch; (54) Guajivos trading for dogs at Gualatalito ranch; (55) Guajivos woman and baby; (56) The owner of Gualatalito ranch holding a parley with the Guajivos; (57) The chief of the tribe of Guajivos; (58) Guajivos Indians at Gualatalito ranch; (59) The corner of the plaza, Arauca; (60) El Amparo and the Arauca river from the Colombian side; (61) Arauca river from El Amparo; (62) Near Guasdualito; (63) Llaneros at Grenadillo ranch, near La Gloria ranch; (64) Llaneros at La Gloria ranch; (65) Iguanas, Palmarito; (66) A large canoe on the Rio Apure near Palmarito; (67) Canoe-men at Boca Suripa; (68) The junction of the Suripa and Apure rivers; (69) Boca Suripa; (70) A jabiru shot near Suripa; (71) The corral at La Calzada de Paez; (72) Cart difficulties on the Rio Canagua; (73) Fording the Rio Paguei; (74 and 75) A jabiru's nest; (76) Ruins of El Marquez, Barinas; (77) Barinas; (78) Cart difficulties on the Rio Yucca; (79) The "road" from the Rio Bocono to Barrancas; (80) The ford Rio Bocono; (81) Tocupido; (82) The Rio Guanare; (83) Guanare; (84) The church, Aparicion; (85) Rio Aguachi; (86) San Carlos church and plaza; (87) El Salto de Tinaco; (88 and 90) The battlefield of Carabobo; (89) Door to Spanish jail, Pore; (91) Llaneros of Casanare and the Provincial Alcalde at El Desecho ranch.

N.B.—It would greatly add to the value of the collection of Photographs which has been established in the Map Room, if all the Fellows of the Society who have taken photographs during their travels, would forward copies of them to the Map Curator, by whom they will be acknowledged. Should the donor have purchased the photographs, it will be useful for reference if the name of the photographer and his address are given.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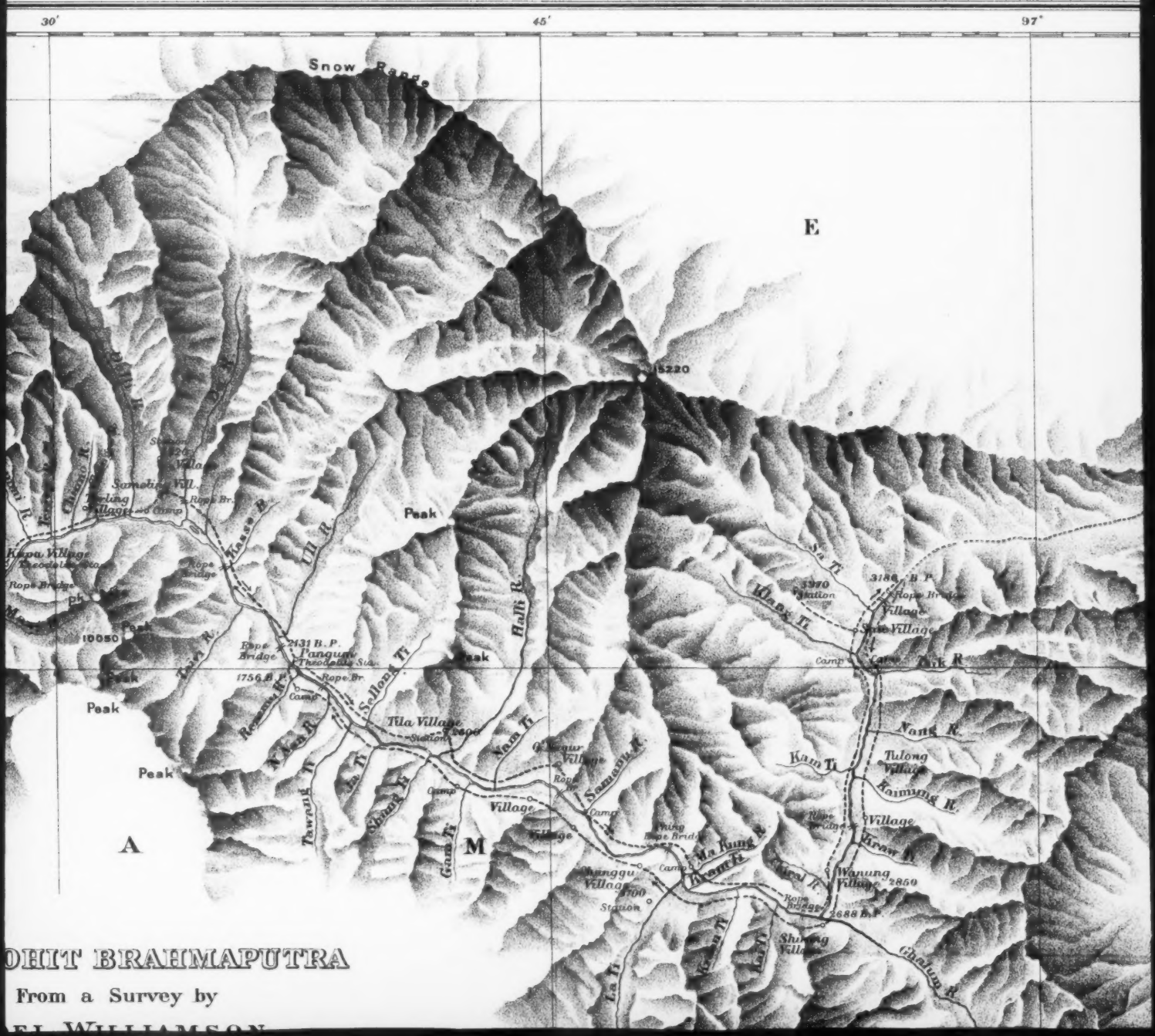
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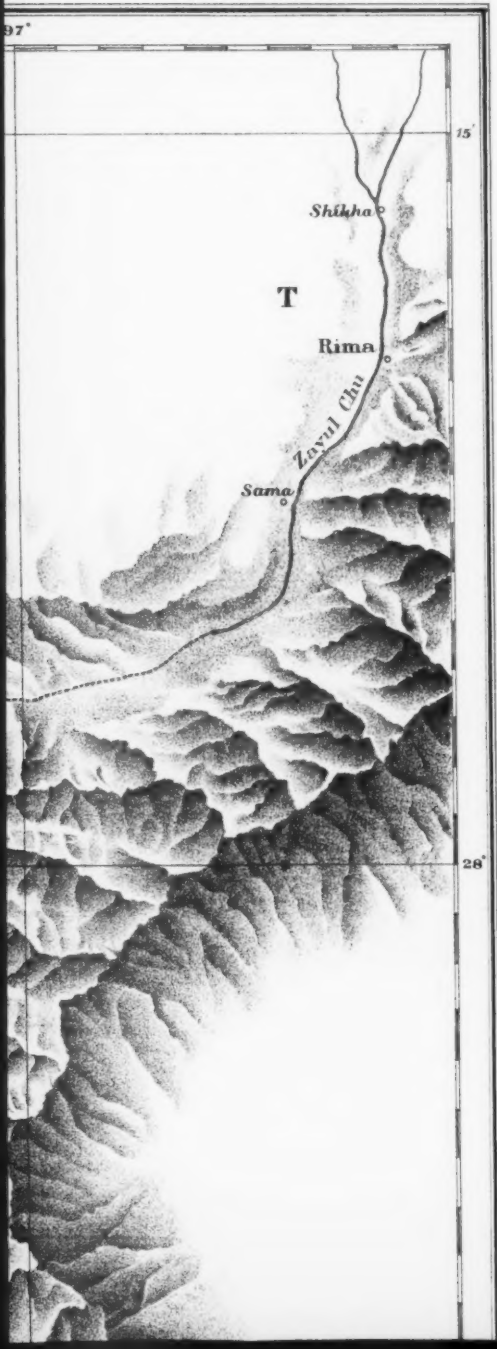

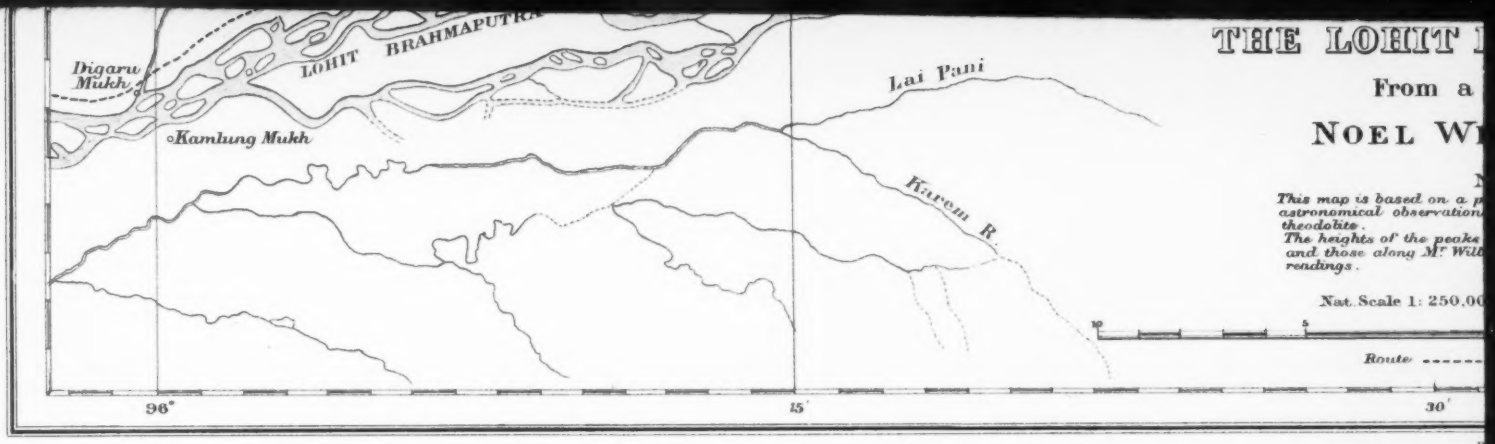

THE LOHIT

From a

NOEL W

This map is based on a
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The heights of the peaks
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Route

OHIT BRAHMAPUTRA

From a Survey by

EL WILLIAMSON

Note

is based on a plane-table survey checked by cal observations for latitude made with a 6 inch

hts of the peaks are from the survey of India, e along Mr. Williamson's route from boiling point

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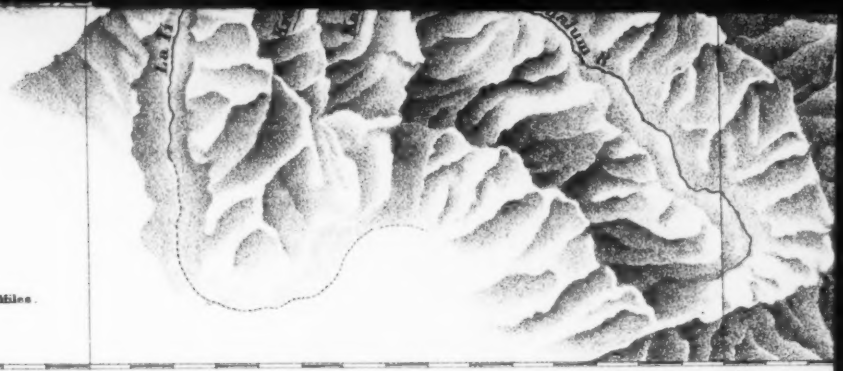
Route -------- *Heights in feet*



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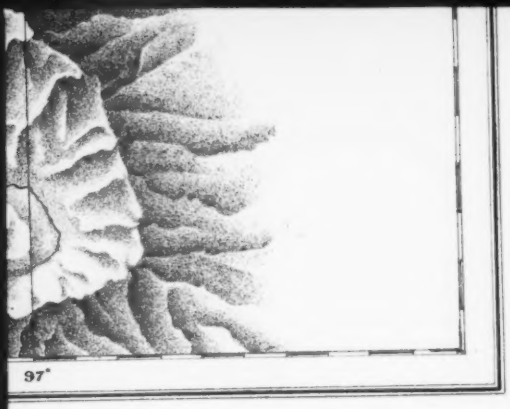
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